THE PAPER INDUSTRY and PAPER WORLD

AN EDUCATIONAL NEWS MAGAZINE — MAY, 1944

TECHNOLOGY DEPT

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MAY 22 1944
DETROIT

DOWNINGTOWN

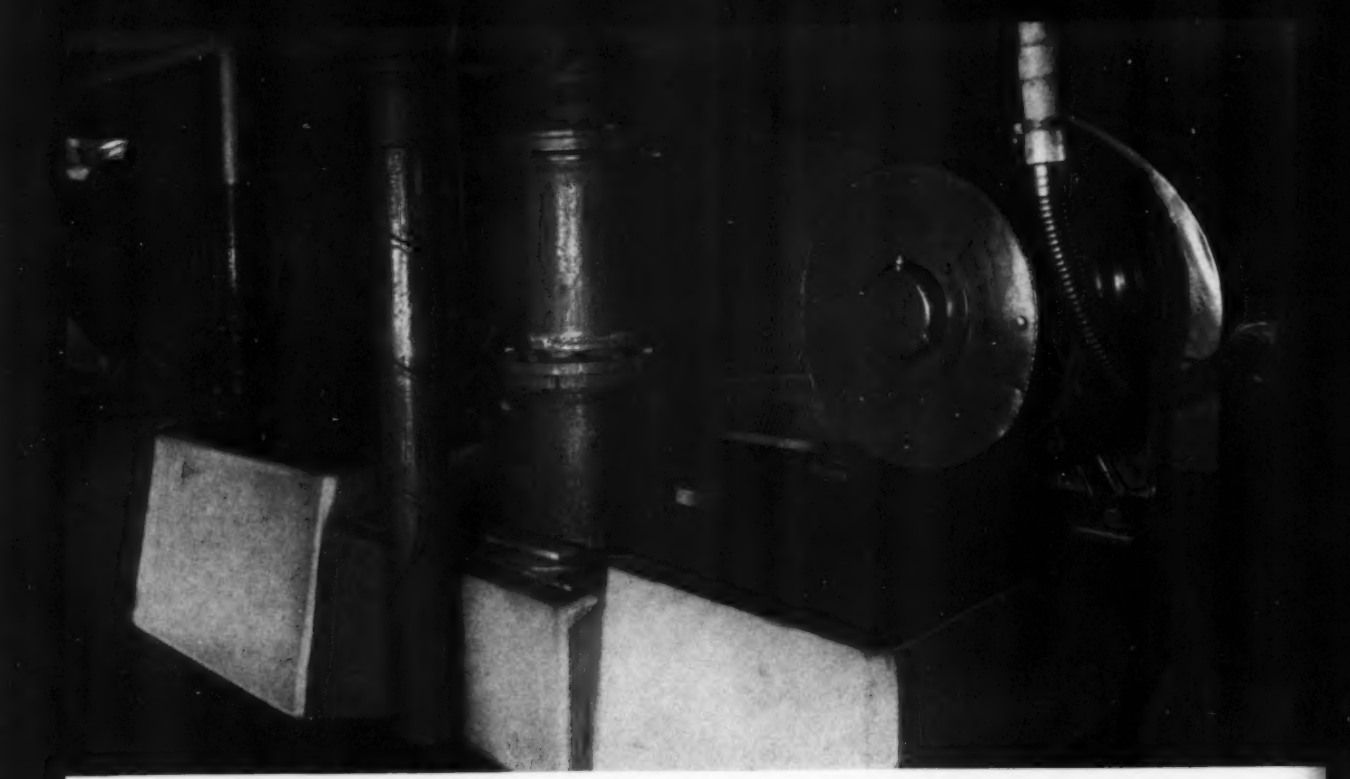
V-BOARD DESIGNED FOR WARTIME NEEDS DESTINED FOR PEACETIME USES

Early in the war, thousands of tons of food and equipment were made useless, after thousands of mile in transit, because of moisture penetration, insect infestation, rust, breakage, and climatic extremes. This was because the ordinary corrugated container, so satisfactory for domestic shipments, proved useless in protecting shipments made abroad. . . . The Weatherproof Box Group of mills went back to work and developed V-Board to solve the problems of wartime shipping needs. It has proved so successful that many manufacturers claim that after the war they will not even go back to wood for shipping cases. We predict many others will learn about V-Board and will use it. . . . Practically every mill in the country that can make V-Board is now doing so. We don't know who made the V-Board used in the boxes shown in this picture, but we do know that with the aid of Downingtown Machinery, our customers listed in the "V" are equipped to do so. . . . Performance of Downingtown Machinery under the stress of wartime conditions is something for every paper and board mill to remember, or investigate, before ordering post-war equipment. Our Engineering Department is at your service NOW. Downingtown Manufacturing Company, Downingtown, Pa.

Box Board Co., Grand Rapids, Mich. O. S. Andrews Co., Chattanooga, Tenn. Bird & Sons, Inc., East Walpole, Mass. Consolidated Paper Co., Monroe, Mich. Containing Corp. of America, Chicago, Ill. Eddy Paper Corp., Chicago, Ill. Fairfield Paper Co., Baltimore, Ohio. Fibreboard Products, Inc., San Francisco, Calif. Fort Wayne Corrugated Paper Co., Fort Wayne, Ind. Gaylord Container Corp., St. Louis, Mo. The Hinde & Dauch Paper Co., Sandusky, Ohio. Hummel & Downing Co., Milwaukee, Wis. Longview Fibre Co., Longview, Wash. National Container Corp., Long Island City, N.Y. B. F. Nelson Mfg. Co., Minneapolis, Minn. Ohio Boxboard Co., Rittman, Ohio. Pioneer Division, The Flintkote Co., Los Angeles, Calif. Waldorf Paper Products Co., St. Paul, Minn.

BOARD

A M
SES OUR
US ERS
RO CT

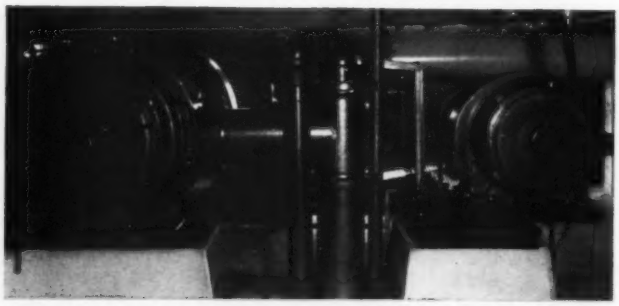


ROCKWOOD *automatic belt tightening* MOTOR BASES

IMPROVES PERFORMANCE OF VACUUM PUMPS TOO

BY eliminating belt slip at load peaks—regardless of the tendency of all belts to elongate and slacken under load, the Rockwood automatic belt-tightening motor drive improves the performance of all driven machines.

With vacuum pumps, as with beaters, the motor on a Rockwood base pulls into the belt as the load increases, giving increased instead of lessened belt tightness, though there is always so ample power to carry through the peak without speed drop due to belt slip. This gives the pumps maximum sustained capacity—and makes their performance more dependable. At the same time, there is scarcely any drive maintenance, and belt replacement is cut almost in half. This is a sizeable saving in itself.

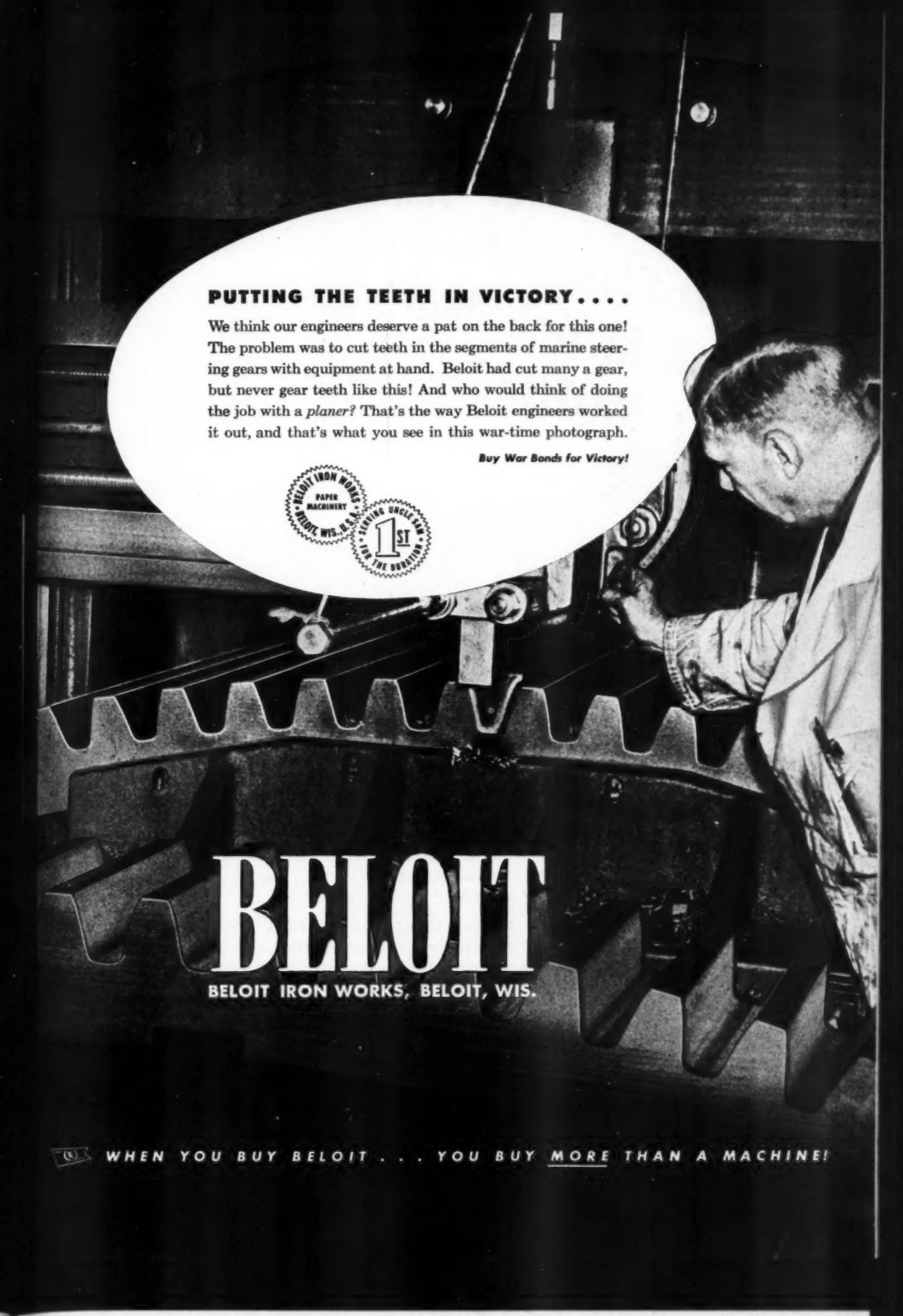


Pictures show two of three drives on Nash Hytor Vac Pumps at Thilmany Pulp & Paper Company. One is 30 h.p. drive on machine flat boxes—other two 100 h.p. drives on suction couch. The pump capacity is increased and its performance made more dependable with less maintenance.

If you are fortunate enough to have the help and the time, it will pay you now to install Rockwood belt-tightening motor bases under *all* belt-driven electric motors. The resulting improvement in machine performance also will be well worth while for postwar operations.

Rockwood bases up to 60 h.p. available from stock—semi-stock sizes for motors up to 250 h.p. delivered with reasonable promptness. Larger size bases made-to-order. Feel free to discuss your drive problems with us. We are always glad to hear from and work with paper mill men.

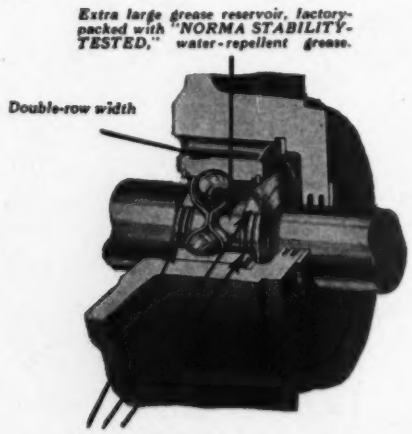
ROCKWOOD MANUFACTURING CO., INDIANAPOLIS, I


PUTTING THE TEETH IN VICTORY....
We think our engineers deserve a pat on the back for this one! The problem was to cut teeth in the segments of marine steering gears with equipment at hand. Beloit had cut many a gear, but never gear teeth like this! And who would think of doing the job with a *planer*? That's the way Beloit engineers worked it out, and that's what you see in this war-time photograph.
Buy War Bonds for Victory!
BELOIT IRON WORKS
PAPER MACHINERY
BELOIT, WIS., U.S.A.
SERVING UNCLE SAM
1ST
FOR THE DURATION
BELOIT
BELOIT IRON WORKS, BELOIT, WIS.
WHEN YOU BUY BELOIT . . . YOU BUY MORE THAN A MACHINE!

ROBBINS & MYERS FEATURE
NORMA-HOFFMANN "CARTRIDGE" BEARINGS

As Standard in R & M Uni-Shell MOTORS

"BETTER BEARINGS FOR LONGER MOTOR LIFE"


Extra large grease reservoir, factory-packed with "NORMA STABILITY-TESTED," water-repellent grease.
Double-row width
Grease grooves and flanged, removable metal seal, on both sides, forming a wearless labyrinth barrier against escape of lubricant and entrance of foreign matter.

From the Robbins & Myers "UNI-SHELL" MOTOR Catalog:— "A motor is as old as its bearings. Good bearings and a properly designed lubricating system are the first steps in insuring long bearing life without excessive wear....The standard ball bearings are completely sealed, double-row width. Such bearings have an extra grease reservoir, insuring years of trouble-free operation."

From a Robbins & Myers "UNI-SHELL" MOTOR Advertisement:— "One of the two main reasons for motor deterioration is bearing wear. That is why we have gone "all out" on bearing standards, types and alignment."

From a Robbins & Myers Letter:— "The excellent record we have obtained from the thousands put in service makes us believe that such a position is justified."

Write for the "CARTRIDGE" BEARING catalog. Let our engineers work with you.

NORMA-HOFFMANN BEARINGS CORP'N, STAMFORD, CONN. . . . FOUNDED 1911

TO WIN THE WAR: WORK — FIGHT — BUY WAR SAVING BONDS!

We get better production as well as showing a reduction in boiler fuel consumption of approximately 26%
[redacted] Packing Co.

required in [redacted] have been considerably [redacted] without this installation as we increased our production capacity considerably over the previous season.
[redacted] Food Products Corp.

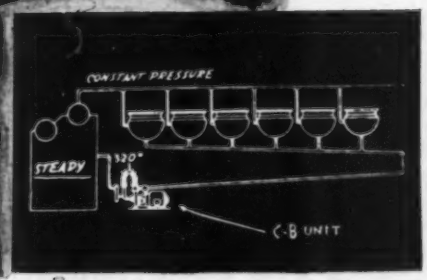
They are almost Unbelievable!

We are pleased with the [redacted] duction in our gas bill (fuel) which the use of your pump has given us and which amounts to 28%, o well in excess of $100.00 per month We have also cut our water bill approximately in half...estimate o savings to be...$140 to $150 per m
[redacted] Hard Rubber C

We formerly used a [redacted] 7 ton of coal per [redacted] have affected a saving [redacted] ton of coal per day or at [redacted] price of coal about $160.00 per month.
The [redacted] Broadway [redacted] Co.

We were in [redacted] creating en [redacted] presses hot [redacted] We were carr [redacted] pressure in our boiler which we have been able to reduce to 100 lbs. and have no difficulty in heating our ironers and presses to a point where it is helping us on our production at least 15%
[redacted] Towel Service Co.

[redacted] plant operates under unusually irregular conditions... for example condensate return varying between 70% and 10%...The C-B System has controlled this irregular [redacted] completely satisfactory from September 1 to March 31 with an increase of 4% in fuel we had an increase in production of at least 20% which indicated without any further checking that we had a considerable saving in oil.
[redacted] Candy Shops

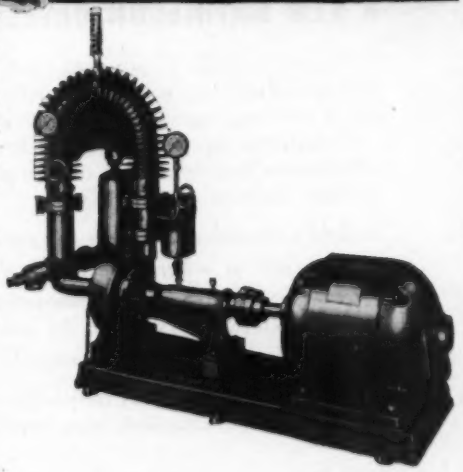


THESE excerpts from letters received from manufacturers who have installed the Cochrane C-B System of High Pressure Condensate Return contain statements that seem incredible. Yet every one is true and each can easily be verified.

Why shouldn't YOU be making savings like these? The method is simple. You merely change from your open system of condensate return to the C-B Closed System, installing the C-B unit consisting of JET pump, priming loop, strainer and air separator. Because the system is closed, there is no flash loss and condensate is returned to the boiler at close-to-process temperatures.

Don't wait for competition to adopt this great improvement in manufacturing process. Write today—NOW—for complete information. Get all the facts about the Cochrane C-B System as it applies to your own operation.

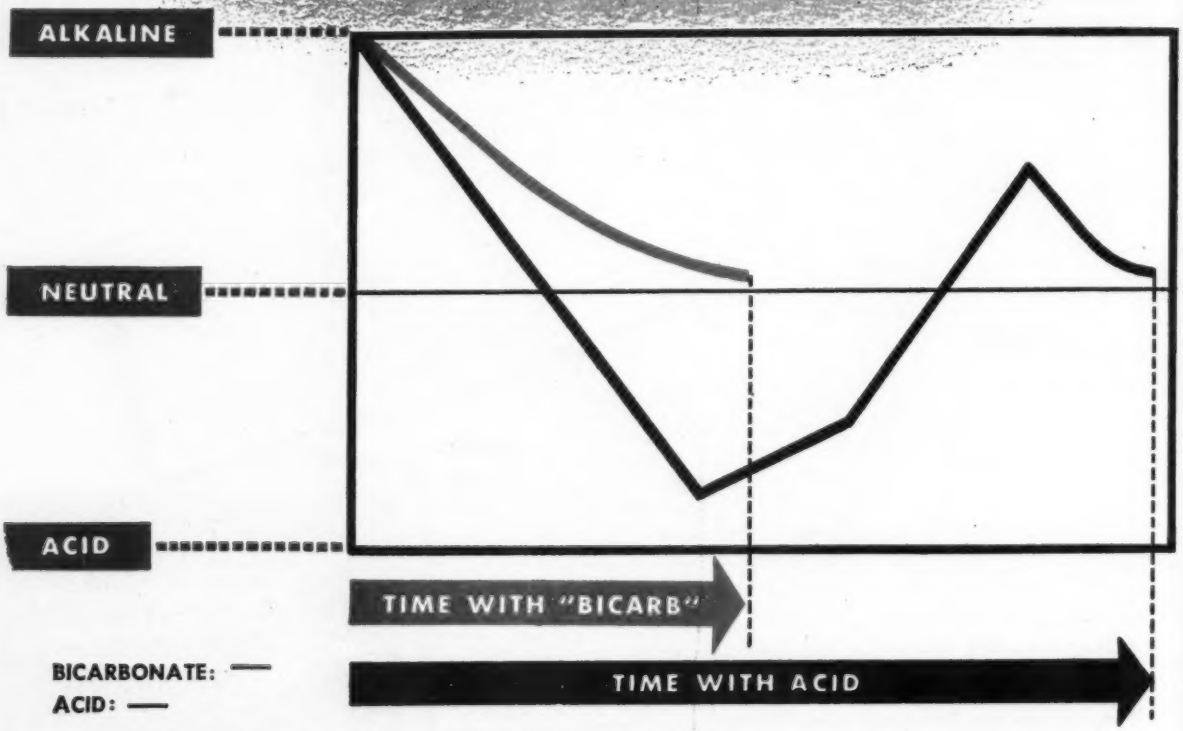
COCHRANE CORPORATION • 3114 N. 17th ST., PHILADELPHIA 32, PA.



COCHRANE C-B SYSTEM

CONDENSATE RETURNED TO BOILERS AT HIGH PRESSURE AND HIGH TEMPERATURE

USE "BICARB" TO REMOVE CAUSTIC!*



A NEW MATHIESON DEVELOPMENT

Eliminating acid's disadvantages, bicarbonate of soda effectively removes caustic by changing it into sodium carbonate or soda ash.

Originated and commercially developed by Mathieson Research, this new process offers certain definite advantages:

- *acid resistant equipment not required.*
- *no health or other hazards involved.*
- *production speeded by elimination of additional steps necessitated by acid process.*
- *careful chemical control unnecessary.*

These advantages, plus new ones stemming from intensive research, may hold important meaning for you – may bring to light possibilities you haven't thought of.

While complete details for the utilization of this process have been evolved specifically for textiles, Mathieson Research is prepared to carry out further assignments in other fields.

For best results, consult our Technical Staff in regard to adapting this new Mathieson development to your particular operations. Write for further information.

Mathieson
CHEMICALS

*PATENT PENDING

THE MATHIESON ALKALI WORKS (INC.) 60 EAST 42nd STREET, NEW YORK 17, N. Y.

CAUSTIC SODA . . . SODA ASH . . . BICARBONATE OF SODA . . . LIQUID CHLORINE . . . BLEACHING POWDER . . . AMMONIA, ANHYDROUS & AQUA . . . HTH PRODUCTS . . . FUSED ALKALI PRODUCTS . . . SYNTHETIC SALT CAKE . . . DRY ICE . . . CARBONIC GAS . . . SODIUM CHLORITE PRODUCTS . . . SODIUM METHYLATE

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Mechanically right—hydraulically efficient

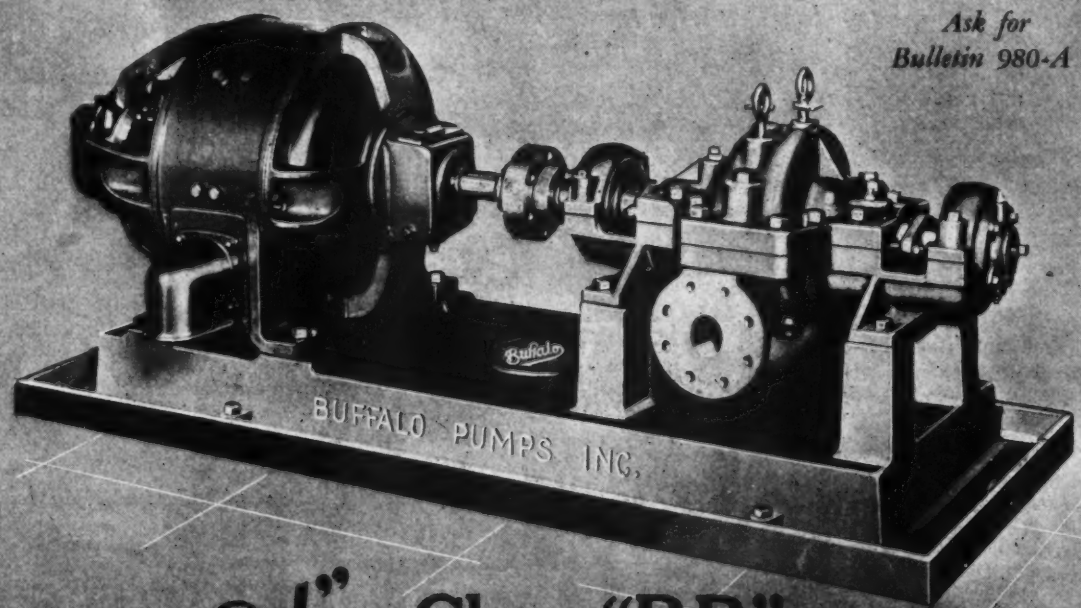
Built to give extra-fine performance handling clear water at high pressure and any temperature, the Buffalo Class "RR" Pump has semi-steel casing divided on horizontal centerline, mounted on centerline supports to equalize expansion around the shaft; enclosed mixed-flow, hydraulically-balanced bronze impellers; bronze-covered shaft; plastic metallic packing suitable for temperatures up to 600°; deep groove double-row angular-contact oversize bearings in dust-proof housing—in short, every mechanical feature desirable in a fine pump.

As for efficiency, the "RR" pump will deliver MORE water at less expense for power—users tell us that actual efficiencies are frequently better than originally specified.

Complete details on Class "RR" 2 and 4 stage pumps contained in Bulletin 980-A.

BUFFALO PUMPS, INC. • Buffalo 5, New York
CANADA PUMPS LTD., Kitchener, Ont.

Ask for Bulletin 980-A



"Buffalo" Class "RR" Single Suction MULTISTAGE PUMPS

IT "HOLDS UP"

LIGHT–STABLE
MAINTAINS CONSTANT VISCOSITY
PRODUCES CONSISTENT RESULTS

From the original formulation to the actual application in your product, Methocel is stable. Its rugged film-forming qualities—its wide viscosity range and chemical compatibility—"hold up" under the most exacting requirements. Whether in its original solid form or in liquid, Methocel maintains constant chemical stability. Odorless, colorless and nontoxic, this water soluble material is also resistant to alkalies, dilute acids, fermentation and mold growth.

METHOCEL
THE UNIFORM SIZING MATERIAL

The unusual ability of Methocel to hold varying types of inks has proven of great interest to the trade. The colorless and odorless features of Methocel, plus its effectiveness in paper sizing, suggest many additional advantages. The use of Methocel as a retarding surface coating for oils, greases, paraffin and paper lacquers at low cost is now an established practice. Combine this with its consistent ability to produce uniform results plus its stability to hold up under most trying conditions. Consult Dow Technical Service for additional data.

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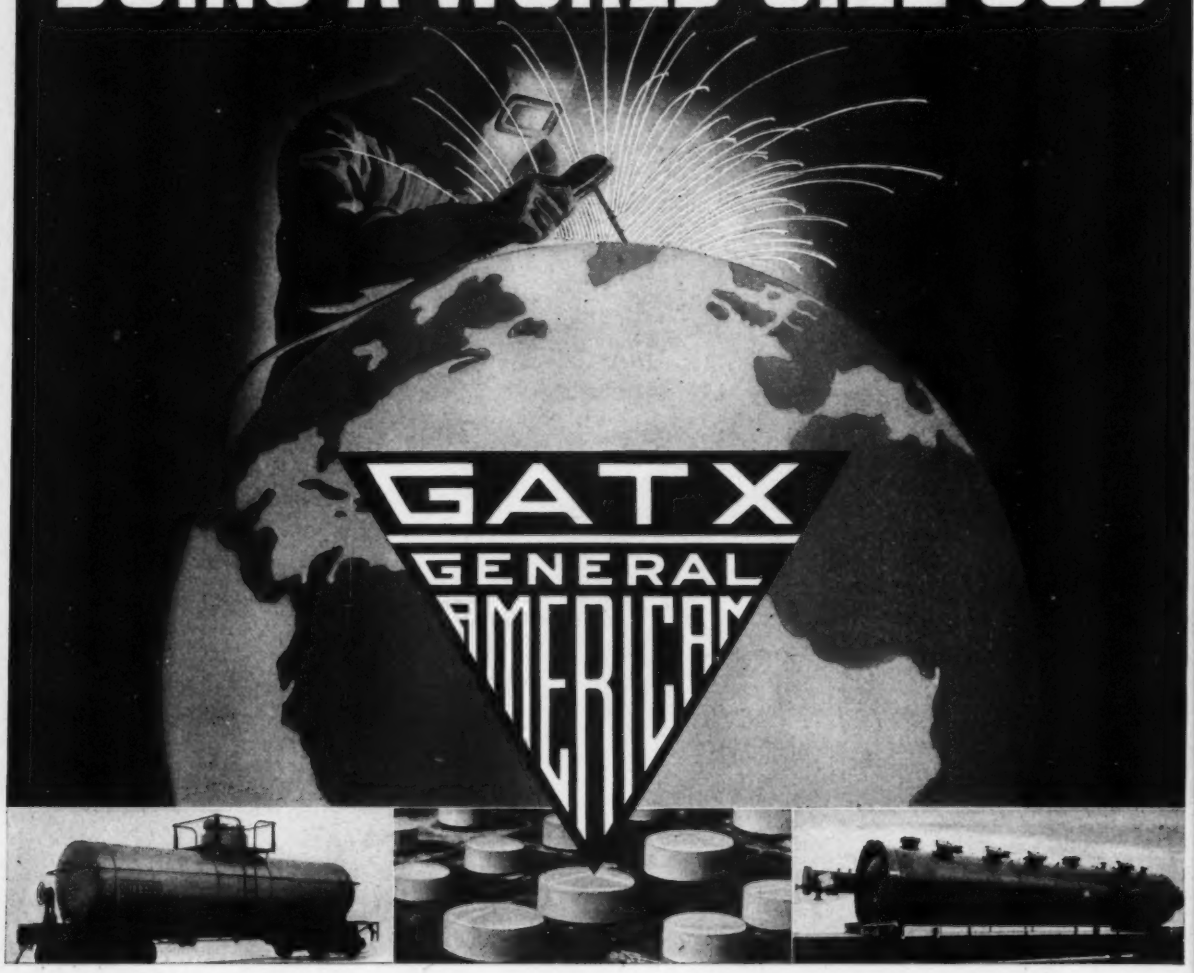
New York • Boston • Philadelphia • Washington • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

METHOCEL

Among the many Dow Products serving the Paper Industry are: Ethocel, Dowicides and Caustic Soda.

DOW
CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

DOING A WORLD-SIZE JOB



SCIENCE tells us the earth itself is a pressure vessel . . . we don't make them *that* big, but we *will* build any size that can be transported by rail. On all quarters of the earth, industry has our pressure vessels at work — proving the meaning of the GATX triangle — the symbol of quality above maximum operating requirements. In this and many other fields, GATX know-how effects production economies for *you*.

GENERAL AMERICAN TRANSPORTATION CORPORATION

Plate & Welding Division — Sharon, Pennsylvania

"Specialists in plate fabrication—manufacturers of pressure vessels of steel, alloys and aluminum—all classes of welding— process equipment of all types—chemical engineering laboratories and service—completely equipped field erection department."

RUBBER
A Weapon of War
The proper selection and use of mechanical rubber goods is an important step in keeping up production of vital war goods.
The BWH personnel has made rubber history with an impressive number of epoch-making inventions and improvements. The BWH production for war is resulting in advancements in design and manufacture which will make BWH post-war products reach new heights of quality and performance.
A leadership of 60 years—in peacetime and wartime service—demonstrates that BWH knows rubber—crude, reclaimed and synthetic!
BOSTON WOVEN HOSE AND RUBBER COMPANY
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WORKS: CAMBRIDGE, MASS., U.S.A. P.O. BOX 1071, BOSTON 3, MASS., U.S.A.

LIKE THE PRETTIEST GIRL AT THE PARTY

TITANOX pigmented papers stand out in any company. Like the prettiest girl at the party they have a very special eye-appeal.

Many paper manufacturers already know these facts and use TITANOX to pigment all their better-quality white and tinted products. They have learned through experience that the blue-white of TITANOX gives greater *visual* brightness than is produced by yellow-toned pigments. This "eye-appeal" quality is enhanced by maximum opacity, even in light-weight stocks, and by unexcelled, permanent whiteness, and fine printing surface.

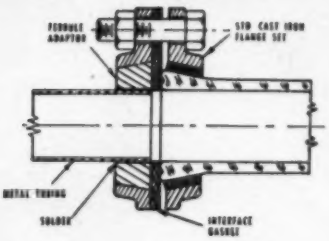
Can your fine papers boast all these desirable qualities?

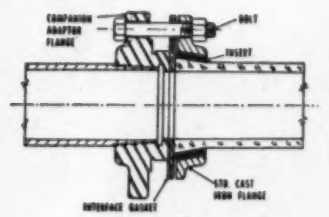
TITANOX

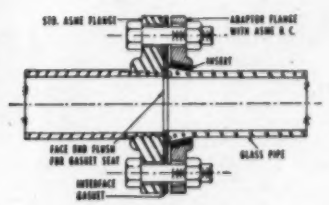
TRADE MARK

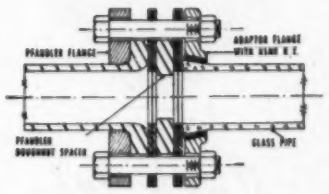
TITANIUM PIGMENT CORPORATION, *Sole Sales Agent* • 111 Broadway, New York 6, N. Y. • 104 South Michigan Avenue, Chicago 3, Ill. • 350 Townsend St., San Francisco 7, Calif. • 2472 Enterprise Street, Los Angeles 21, Calif.

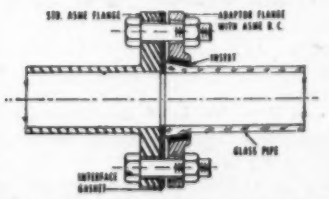
any equipment











Are you passing up the advantage of PYREX brand Glass Piping because of uncertainty about joining it to existing lines and equipment of other materials? There is no need to, because standard adaptor connections are stock items for coupling PYREX Glass pipe to steel, cast iron, lead, stainless steel, porcelain, hard rubber and rubber covered metal.

Bring to your plant the advantages of resistance to all acids (except HF), and alkalies, resistance to thermal shock, transparency, smooth hard interior surfaces that minimize friction in fluid flow, and long service life. Chemical plants, drug, food and beverage manufacturers have found PYREX Piping indispensable to efficient and economical operation.

You can join PYREX Piping anywhere in your existing line. You can get good tight leakproof connections to whatever piping or equipment you are now using. Why not specify PYREX Piping for your next unit replacement? We are confident that once you experience the benefits of PYREX Piping you will follow a trial installation with a complete glass piping system.

For complete details, use this coupon.

"PYREX" is a registered trade-mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

Corning Glass Works, *Industrial Div.*, Dept. PI5, Corning, New York.

Gentlemen:

I would like glass piping information immediately on the subjects I have checked below. I understand there is no obligation.

☐ Installation Manual ☐ Valves ☐ Adaptors
☐ PYREX Piping and Heat Exchangers

Name.....

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City and State.....

CORNING
Glass Works
Corning, New York

Pyrex Industrial Glass

"Lest We Forget"*

. . . that every day brings us nearer to Victory

. . . that we fear no oppression or destruction while we fight for that which is right

. . . that the smallest service we render is another step toward peace

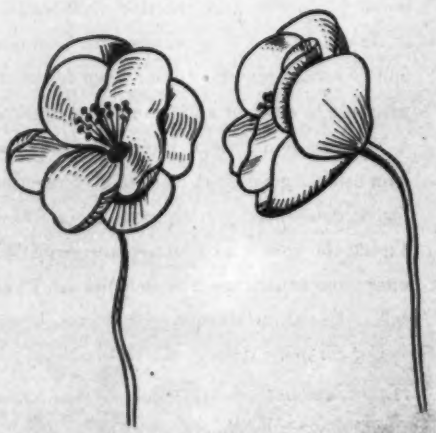
. . . that every person connected with the paper industry is enlisted for service on the home front

. . . that our armies must have an uninterrupted supply of everything the industry can produce

. . . that when peace again reigns on the earth, there will be a new era—already the gray dawn is seen

. . . to remember those who are fighting far from home

let us pay tribute to those who have given *all* that freedom may live.



(*) "Lord God of Hosts, be with us yet,
Lest we forget—lest we forget."
—From "The Recessional," by Rudyard Kipling.

TRADE WINDS

★ ★ ★

Paperboard Mill in Puerto Rico

▸▸▸ A CONTRACT HAS BEEN awarded to construct a paperboard mill for the Puerto Rico Development Company of San Juan, Puerto Rico, which is the culmination of a year's work in studying the proposed project and negotiating contracts for the major items of equipment.

The mill is one of a number of projects being developed by the above company to help raise the standards of living in this Island Possession of the United States, and at the same time, manufacture locally, certain products for which there is a good demand.

Mill Capacity

The mill is being built to meet the present requirements for about 40 tons per day of paperboard for the manufacture of containers and boxes, but the productive capacity can be doubled with very few changes when the demand warrants.

The chief raw material will be waste paper collected in Puerto Rico, supplemented by pulp made from bagasse obtained from nearby sugar cane "Centrals."

The mill is to be built in the suburbs of San Juan, which is the chief port and largest city of Puerto Rico. It is to be of modern design as can be judged from the accompanying perspective view. Production of paperboard is scheduled early in 1945.

The buildings are of reinforced concrete construction throughout and designed to withstand the hurricanes which occur periodically.

Mill Equipment

The main equipment being installed consists of the following:

A 6-cylinder paperboard machine having about 90 inch trim and equipped to make either rolls or sheets.

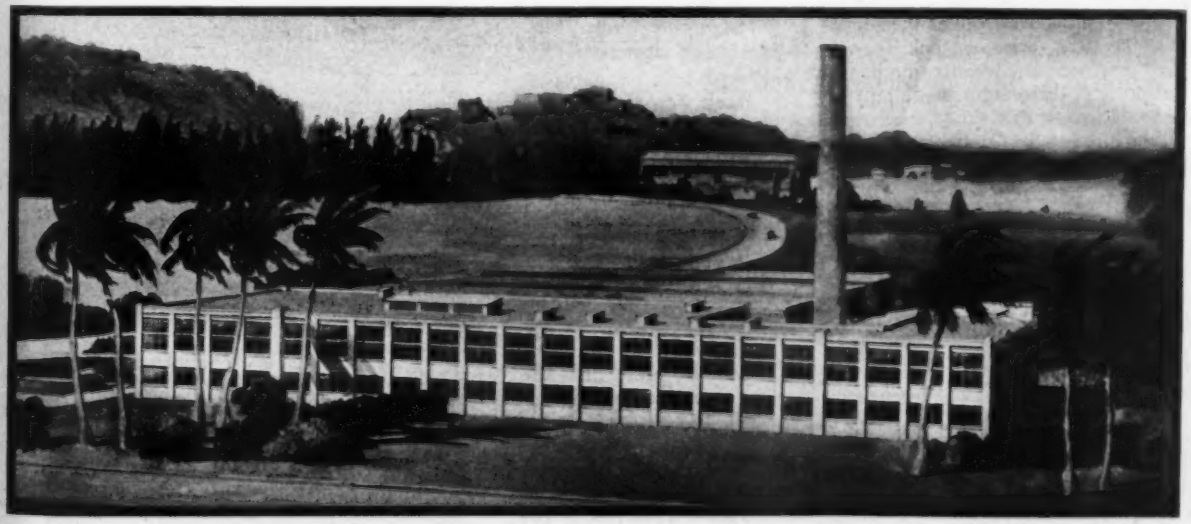
The machine room has a modern vapor exhaust system and traveling cranes.

A wastepaper warehouse will provide facilities to store, sort and bale wastepapers according to grades. From here it will go to the usual stock preparation system consisting of beaters, jordans, rifflers, screens and deckers.

Bagasse, in bales, is to be stored in large outdoor piles holding nine months' supply. Such large storage is necessary because sugar cane, from which bagasse is derived, is harvested but once a year.

From the storage piles, the bagasse will be conveyed to the pulp mill where it will be cooked in large rotary digesters. It will then be washed and refined before mixing with the other raw materials used in making board.

It is planned to install boilers of sufficiently high pressure so that the steam required for process is adequate to make enough power so that the mill will be self-contained. However, the mill is to be tied in to the local power company's transmission line. The water will be supplied from wells,



Artist's drawing of paperboard mill to be built in Puerto Rico.

while the mill effluent will be carried out into the harbor.

Particular attention has been paid to make working conditions pleasant by the installation of modern locker rooms, good ventilation and lighting, and substantial construction.

Experimental Work

Before process details were worked out, a good deal of preliminary research work had to be done. Experimental work was carried out to determine the procedure to follow in cooking and preparing bagasse pulp. This was then followed by cooking pulp in a commercial installation and then introducing it in certain percentages in the manufacture of jute container board. Arno Nickerson, of New York City, is being consulted on paper board process problems and K. O. Guthrie, of Pleasantville, New York, is now in Puerto Rico as Field Engineer on this project.

Wastepaper Collections

Puerto Rico has a population of two million, and a survey of the Island was made to determine the amount of wastepaper which may be collected economically. This indicates sufficient is available to meet the anticipated demand. A widespread collection system is now being set up on the basis of what is considered good practice, and it is planned to get the system into smooth operation by the time mill construction is completed.

Design of Mill

The mill is designed by Roderick O'Donoghue, consulting engineer, 420 Lexington Ave., New York City and construction is being carried out under his supervision. He will purchase all equipment and will hire the key personnel consisting of general superintendent, tour bosses, beater men, machine tenders, digester cook, power plant engineer and master mechanic. Inasmuch as there is no paper mill in Puerto Rico at this time, these men will be hired in the Continental United States.

◆

FINANCIAL

A combination of weak stock market prices,, presumably due to invasion jitters on the part of investors, and the prospect of reduced output due to pulp allocation procedure, served to depress paper mill securities in April as compared with the bullish tendency in March.

American Tissue Mills—Net profit in 1943 was $107,986 as compared with $94,586 for 1942.

American Writing Paper Corporation—Net profit for the first three months of 1944 was $56,790 as compared with $54,134 for same period in 1943.

Brown Company—Net profit for the fiscal year ending November, 1943 was $1,126,415, as against $2,107,076 for the preceding year. The major factor in this reduction of earnings was the inability to get woodsmen to provide the company's needed supply of pulpwood.

Champion Paper and Fibre Corporation—Earnings for forty weeks to January 30, 1944, were $1,523,609, as compared with $2,088,486 for the same period of the previous fiscal year.

Container Corporation of America—Net profit for the first three months of 1944 amounted to $569,517 as compared with $377,359 for the same period in 1943.

Continental-Diamond Fibre Company—Net profit in 1943 was $460,286 as compared with $562,586 in 1942.

Eddy Paper Corporation—Net profit in 1943 was $591,613 as against $475,408 in 1942.

Robert Gair Company, Inc.—Net profit for the first three months of 1944 amounted to $77,673 as compared with $98,281 for the same quarter in 1943.

Gaylord Corporation—Net profit in 1943 was $1,103,097 as against a slightly lower net in 1942. Net earnings for 1943 were $1.56 per share as against $1.55 in 1942.

Hummel-Ross Fibre Corporation—Net profit for the first twelve weeks of 1944 was $66,711, as against $38,517 for the comparable period in 1943.

Hurlburt Paper Company — Net profit for 1943 of $30,797 compared with $61,407 in 1942.

International Paper Company—Consolidated net profit for 1943 was $8,413,808 as against $7,814,319 in 1942.

Maine Seaboard Paper Company—Net loss of $92,201 in 1943 as against a profit of $169,828 in 1942 was due to inability to secure sufficient pulpwood to continue normal operations.

Minnesota and Ontario Paper Company—Net profit of $237,824 for the first three months of 1944 compared with $343,422 for the same period in 1943.

National Pole and Treating Company—Net profit of $11,627 for the first three months of 1944 compared with $12,626 for the same period in 1943.

San-Nap-Pak Manufacturing Company—Net profit in 1943 was $90,181 as against $146,104 in 1942.

Scott Paper Company—Net earnings first three months of 1944 were $321,602 compared with $340,349 for the corresponding period in 1943.

Sutherland Paper Company—Profit for the first quarter of 1944 was $626,605 as compared with $642,124 for the same quarter in 1943.

New York Stock Exchange—Stocks

	Closing Prices April 25	March 25
A. P. W. Paper Co.	*2¼–2½	3
Celotex	11½	12
Same Preferred	*17⅝–17⅞	17½
Certain-teed Products	4⅝	5⅝
Same Preferred	57½	62¾
Champion P. & F. Co.	*22–22¾	25
Same Preferred	108⅛	109¼
Container Corp.	22¼	23¼
Cont. Diamond	11	12⅜
Crown Zellerbach	16	17
Same Preferred	91	98½
Dixie Vortex	16½	16
Same "A"	44⅞	44¼
Robert Gair	3½	3½
Same Preferred	13¾	14⅞
Gaylord Container	*14–14½	14½
Same Preferred	54	54
International Paper	13⅜	15
Same Preferred	71⅞	74½
Kimberly Clark	*35¼–36	34
McAndrews & Forbes	*25¾–26⅛	26½
Masonite	43¼	38½
Mead Corp.	8½	9⅜
Same Preferred	*89½–90	*88–90
National Container	13¼	14¼
Paraffine Cos.	*47⅛–48½	48½
Same Preferred	105	105
Rayonier	14	15
Same Preferred	30	30
Scott Paper	*38½–39½	39½
Same 4½% Pfd.	*109½–112	*109–110
Same 4% Pfd.	*109–112	108¾
Sutherland Paper	*30½–31½	31
Union Bag & Paper	9½	10⅜
U. S. Gypsum	71	71½
Same Preferred	176	*176–179½

New York Stock Exchange—Bonds

Abitibi 5%	68½	71½
Celotex 3¾%	103½	103⅞
Certain-teed 5½%	101¼	100½
Champion P. & F. Co. 4½%	.....	.....
Inter. Paper 5%	104	104½
Same 6%	106½	105¾

New York Curb Exchange—Stocks

Am. Boxboard	.....	.....
Great Northern	33	33
Hummel Ross	5¼	5¼
St. Regis	4¼	4⅜
Taggart	5½	5¼
United Wall Paper	2½	2½

*Closing Bid and Asked Prices

◆

▶▶▶ THE NEWLY CONSTRUCTED fourteen-mile highway between Hampden and Upper Humber River, Newfoundland, marks the opening of the Notre Dame Peninsula, source of rich pulpwood supplies, and represents a significant forward step in the development of the Colony. Heretofore, small amounts of pulpwood have been taken from this reserve and moved by boat to Corner Brook, some 375 miles distant. With completion of the new highway, the movement of pulpwood from this region will be expedited.

PAPER · · · America's 6th Industry

PAPER GUARDS AGAINST GAS

(NEWS ITEM: *Paper bags are being manufactured to protect our soldiers from aerial gas attacks.*)

Individual "tent-like" bags are being furnished to our Armed Forces for use in Chemical Warfare. Made of cellulose, with a transparent cellophane top, these bags are strong enough to supply complete protection against even the painful effects of mustard gas.

Paper cans for paint, paper boxes for tank parts, paper bags replacing steel drums for shipping food, paperboard cartons for blood plasma . . . New uses for paper, calling for new standards of lightness and toughness; new standards of quality in performance . . . New responsibilities—new opportunities for the Pulp and Paper Industry.

American Industry at War is doing more real, hard constructive thinking than at any time in its history. Our Research and Development Committee, working today on the problems of America at War, is utilizing the many practical and technical advantages being learned . . . Resulting in more efficient Paper Making Machinery for the future.

Puseyjones engineers will welcome the opportunity to work with you in your Post-War Planning. We have prepared three informative articles, "The Post-War Fourdrinier," "Development of Stream-Flow Vat System," "The Flow Spreader." Ask for reprints by name.

THE PUSEY AND JONES CORPORATION
Established 1848. Builders of Paper-Making Machinery
Wilmington, Delaware, U. S. A.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

★ ★ Washington News ★ ★

WPB TECHNICAL STAFF WILL STUDY CONTAINERS

A technical staff has been established within the WPB Paperboard Division to study all types of fiber shipping containers in an effort to save paperboard. The WPB feels that it must maintain control over the available supply of paperboard.

To complement the orders regulating both the manufacture and use of available paperboard, a technical study is now being made by the Paperboard Division of all types of fiber shipping containers, folding cartons, set-up boxes and other paperboard products, to ascertain if many of them could be made of lighter weight board without endangering their value as merchandise containers.

J. D. Malcolmson, formerly technical director of Robert Gair Company, Inc., New York City, has been designated chief of the technical staff, and Philip F. Holton has been appointed deputy chief. Mr. Holton formerly was manager of the Indianapolis plant of Inland Container Corporation.

Mr. Malcolmson states that a great number of packages today are improperly designed and require too much paperboard. Pointing out that these shortcomings apply to both civilian and armed service packaging, he explains that no moves will be made tending to reduce the strength of containers to a point where loss and damage to contents shipped might occur.

▶▶▶ A TWO-MONTH experimental period commenced May 1 between representatives of the WPB and the Canadian Newsprint Administrator for the production by Canada of 30-pound newsprint. This agreement was put into effect in order that U. S. newsprint publishers may experiment in a practical way with 30-pound newsprint if they wish to do so. However, all U. S. publishers' orders for 32-pound paper will be filled completely by Canadian mills. During this experimental period, the former agreement on the part of Canada to furnish 200,000 tons of 32-pound newsprint a month has been suspended.

▶▶▶ THE OPA HAS ANNOUNCED that effective May 1, and until July 31, lightweight newsprint manufactured outside the United States may be bought by United States consumers at ceiling prices not in excess of $4.00 per ton above maximum for standard weight newsprint. The specific differential is established at the request of foreign producers of newsprint, in order that foreign lightweight newsprint may be granted the essential as lightweight newsprint produced in the United States.

▶▶▶ THE TOTAL PRODUCTION of wrapping paper and bag paper in the second quarter of 1944 will be about 11 per cent less than in the first quarter, and approximately 23 per cent less than was manufactured in the second quarter of 1943, according to release from the Forest Products Bureau of WPB. The shortage of this type of paper is due to the necessity of making great quantities of shipping containers, waterproof paper and multiwall bags for the armed forces.

PRICE CEILINGS ON IMPORTED PULPWOOD

Price ceilings on pulpwood imported into the United States became effective for the first time on May 1. The imports affected are from the Canadian Provinces of Quebec, New Brunswick and Nova Scotia. These ceilings are lower than the prices that have been paid for some time by importers of this pulpwood.

Importers are mainly New York and New England manufacturers making pulp, paper, paper products, and other important items essential to the war program and to the civilian economy. Price ceilings on these products are not affected by today's action. The difference between the new pulpwood ceilings and prices currently being paid by importers varies with each buyer.

▶▶▶ THE PULPWOOD SITUATION has been somewhat eased by the fixing of a ceiling price for Canadian wood which is expected to encourage the shipment of imported wood for American mills. An adjustment of prices in the northeastern states and the assignment of a large number of prisoners of war to pulpwood cutting has helped to ease the domestic shortage.

▶▶▶ A COMPLAINT BY the Federal Trade Commission against wax paper manufacturers on the charge of price fixing raises some strange points. Three years ago the Department of Justice secured indictments against the same manufacturers and the American Waxed Paper Association, and convictions resulted. The Association was dissolved and now the Federal Trade Commission is initiating a duplicate of the same action against the same firms, and including the Association which has been dead for three years.

PAPER MILL MACH'Y PROCUREMENT ORDER

Paper mill machinery and parts may be purchased, leased, rented or delivered, if deliveries are obtainable under maintenance, repair, and operation ratings as defined under CMP Regulation No. 5, according to announcement from the Paper Division of the WPB.

An amendment to order L-83 covering restrictions as to procurement of paper mill machinery, clarifies the order with respect to not requiring WPB approval to secure machinery orders of less than $2,000 within a four-week period for repair and maintenance parts, or more than $2,000 when, and only when, there has been an actual breakdown or suspension of operations.

▶▶▶ THE QUESTION OF 30-POUND newsprint has been adjusted with Canada. The Canadian newsprint administrator, who forbade the manufacture of this weight until April 30 has agreed with the War Production Board to permit the experimental production of the light weight paper for sixty days, at an advance of $4 in the ceiling price for the 32-pound paper.

◆

MARCH PULPWOOD MORE THAN A YEAR AGO

The latest release from the War Activities Committee of the Pulpwood Consuming Industries states that Mill receipts of domestic pulpwood in March showed improvement over the same month in 1943, but the first quarter is still lagging behind a similar period in 1942. Forecasts for the second quarter of this year indicate that pulpwood production faces a much more serious manpower shortage as farmers spend more time on food production and new draft rules take their toll of woods workers.

First quarter mill receipts of domestically produced pulpwood were 3,865,000 cords which was somewhat less than the actual needs for domestically produced pulpwood for this period.

Imports of pulpwood from Canada in March totalled 145,000 cords which brought the month's over-all receipts at U. S. Mills to 1,482,000 cords. The War Activities Committee warned against undue optimism which might be caused by the fact that receipts of

SO EASY... to keep your Seybold shipshape!

1. Just *once a day*—Lubricate drive shaft bearings, clutch and moving parts. Inspect cutting knife.

2. Simply *once a week*—Check the clutch and brake adjustment carefully and thoroughly.

3. Only *once a month*—Inspect the clamp pressure mechanism, and your Seybold will last for years.

Take a smart tip from the "Three Admir-ables" and see how easy it is to keep your Seybold sailing smoothly... because there are no new Seybold machines available under wartime restrictions, except on special approval of War Production Board. Needed repairs can be taken care of promptly through our nearest office.

Your Seybold was built with unusual endurance qualities. Treat it like a jewel.

SEYBOLD

• DIVISION •

HARRIS-SEYBOLD-POTTER CO., 823 WASHINGTON ST., DAYTON, F-7, OHIO

SEYBOLD SALES AND SERVICE

New York: E. P. Lawson & Co., Inc., 426 West 33rd St.

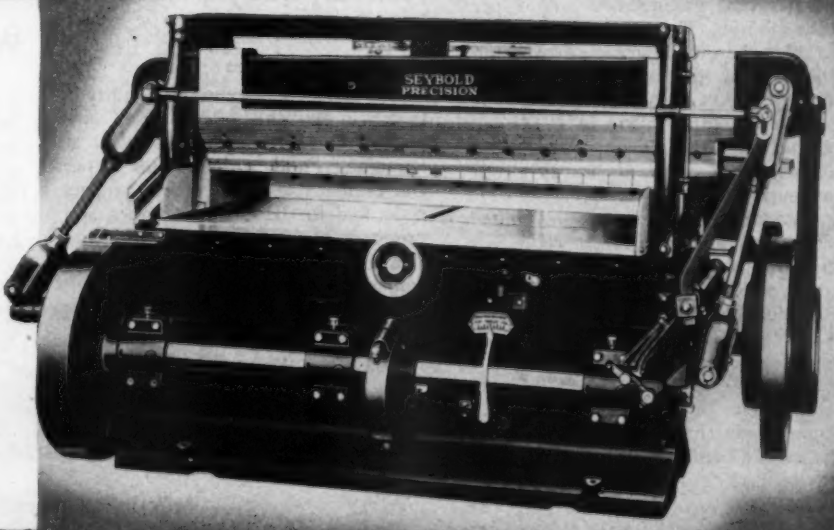
Chicago: Chas. N. Stevens Co., Inc., 112 West Harrison St.

Dayton, Ohio: Harris-Seybold-Potter Co., 823 Washington St.

Southern Sales District: Harris-Seybold-Potter Co., 220 Luckie St., N. W., Atlanta, Ga.

West Coast Distributor: Harry W. Brintnall Co., San Francisco, Los Angeles, Seattle.

Canadian Distributor: Harris-Seybold-Potter (Canada) Ltd., Toronto and Montreal.



Region	March, 1944	February, 1944	March, 1943
Appalachian	121,000	122,000	92,000
Northeast	160,000	175,000	173,000
Lake States	341,000	349,000	145,000
South	512,000	502,000	464,000
Pacific Northwest	203,000	164,000	169,000
Totals	1,337,000	1,312,000	1,043,000

domestic pulpwood for the first quarter of 1944 ran 25 percent above receipts of domestic pulpwood during the first quarter of 1943, because the 1943 period was the worst slump period during the War to date.

The Northeast, where domestic pulpwood deliveries were held up pending an increase in OPA price ceilings, fell from 175,000 cords in February to 160,000 cords in March. The Lake States, which earlier in the year experienced a high production of rough poplar, dropped in March 8,000 cords below their February receipts. The Appalachian region fell 1,000 cords below the previous month.

The record in rough cords of receipts of domestically cut pulpwood by regions (excluding imports) is shown in the above table.

Imports of pulpwood by U. S. mills were distributed as follows: Northeast, 109,000 cords; Lake States, 29,000 cords; and Pacific Northwest, 7,000 cords.

◆

IMPORTS

The question of whether wrapping paper not wholly consisting of kraft pulp is dutiable at 20 per cent as kraft wrapping paper or at 25 per cent as other wrapping paper is before the United States Customs Court, according to Warren B. Bullock, manager of the Import Committee of the American Paper Industry. The shipment in question is a sheet 75 per cent kraft, 20 per cent groundwood and 5 per cent sulphite. The paper was classified as other than kraft wrapping paper on the basis of the classification of kraft paper in effect at the time of the trade agreement with Finland in 1936, and not on the basis of any later definitions of wrapping paper set up as a war measure by the OPA.

Pending a decision by the United States Customs Court on the claim that filtering paper in disc form is dutiable at 30 per cent as paper cut into shape, and not at the rate for tissue or filter paper, the Bureau of Customs has instructed collectors to impose this rate even on the true filter paper imported from England, as well as on the coffee filter paper formerly imported from Japan. Whether or not the new rate will apply to high priced English paper instead of the rate, lower in this case, of 2½ cents per pound and 7½ per cent, is before the Court. The British Reciprocal Trade Agreement fixed the latter rate, and the importers of the high grade paper claim the Trade Agreement affects filter paper in whatever shape it may be imported.

◆

FOREIGN PAPER ITEMS

The April 22 issue of *Foreign Commerce Weekly*, contains the following very interesting article regarding paper and related products:

Argentina

The foreign press reports the successful use of bagasse as a raw material in the manufacture of paper and paperboard by a recently established Argentine mill.

Australia

A widespread survey of native timber resources is being conducted by the government in an effort to ascertain the availability of timber for a proposed postwar wood pulp industry in the southwest. It was found that sufficient stands of marri timber are available, and experiments are under way to determine the best methods of treatment. Plans for the development of a transparent paper industry also are receiving consideration, and expansions involving approximately $16,140,000 have been proposed for Tasmania's newspaper industry.

Peru

The paper industry in this country is largely in the hands of two major companies. One firm operates a plant at Paramonga and manufactures paper and cement bags. The other company is located in the city of Chosica and produces paper, gray cardboard and asphalt roofing. Total production amounted to approximately 9,000 metric tons during 1943, and both plants have been modernized and expanded.

Spain

Approximately 6,000 square kilometers are being used for the cultivation of esparto grass, and according to a foreign trade journal, the estimated annual yield is 200,000 tons. This grass is more than fifty per cent cellulose, and a valuable source of paper pulp. A yield of 200,000 tons would produce 80,000 tons of paper pulp.

U. S. S. R.

This country recently completed tests looking to the production of paper from waste konof (Asiatic hemp). It is reported that the insulating properties of this type of paper are equivalent to those of paper made from cellulose.

◆

▶▶▶ A NEW TYPE of lignin plastic has engaged the attention of the research department of Howard Smith Paper Mills, Ltd., of Montreal, Canada. Although still in the experimental stage, the project appears to possess promising postwar possibilities, and company directors are proceeding with plans looking to the installation of whatever plant facilities may be necessary to produce this commodity in marketable form.

◆

K-C MAKES PLASTIC FROM FABRIC SCRAP

According to an item in *C. E. D. News*, large quantities of waste fabric piling up in warehouses all over the country were reclaimed by Kimberly-Clark Corporation, Neenah, Wisconsin. This scrap possessed high phenolic resin content and was made into an impregnated plastic paper capable of being molded by high pressure into laminates that can be sawn, drilled or punched.

Called *Kacelite*, this new plastic is being used in the manufacture of aircraft floors and ammunition boxes. It also can be applied to various types of plywood surfaces in the home building field.

◆

WAR REALLY BITES INTO USE OF PAPER

Current newspaper stories about the need for conserving wrapping paper and containers do not begin to tell the story of the most severe impact of the War on the paper industry. Housewives have been notified that they will be required to confine their use of wrapping paper and paper bags to a basis of one such item for each three customarily used in prewar days.

This is the real story back of the pulp allocations for the second quarter of 1944. A material reduction in allocations for some basic grades has been accompanied by special orders requiring individual mills to make spe-

MILES of Press Felts in MILLS All Over This Continent

are running continuously clean and uniformly absorbent day in and day out — thanks to

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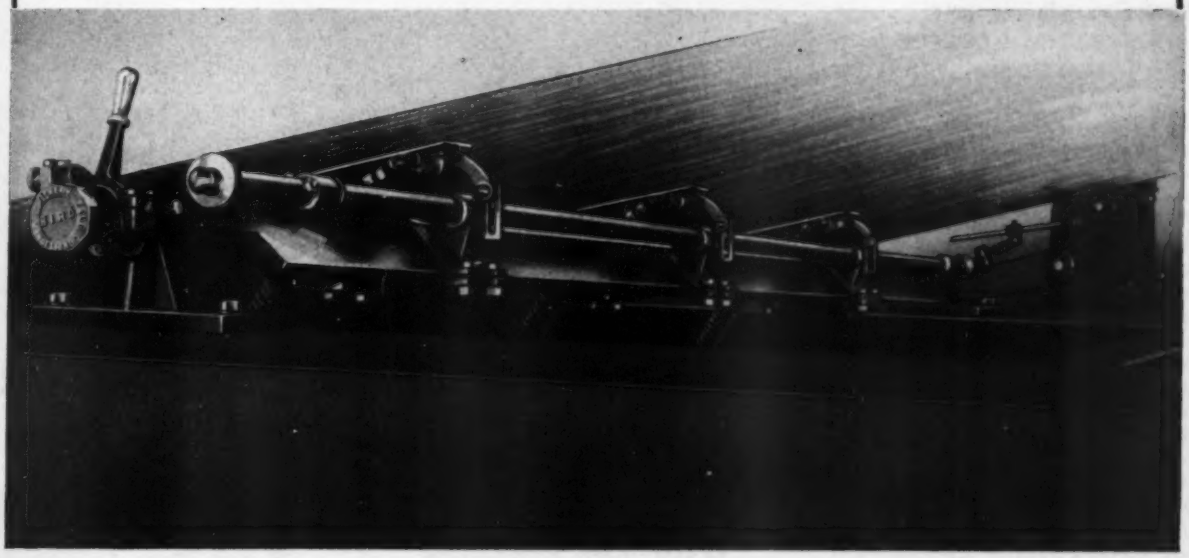

Think what this means in terms of uninterrupted paper machine production, better finish and lower drying cost. Keep all Conditioners on the job and doing their job 100%. Check with us if there's any question about it.

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cific sub-grades only in accordance with the military needs of the country. A material portion of the pulp allocated has been provided for the manufacture of container boards and output of other standard grades reduced proportionately.

This condition may not continue in the third quarter if an adequate supply of pulpwood comes forward, and pulpwood receipts are actually ahead of last year, though not up to the estimated requirements. The container and wrapping situation is so serious that container board can only be manufactured for specific military and essential needs, and not used for the normal civilian market.

◆

EMPLOYEES IN THE SERVICE RECEIVE K-C COMPENSATION

Supplementary compensation totaling $143,801 has thus far been paid by the Kimberly-Clark Corporation of Neenah, Wisconsin, to its 1,531 employees now serving with the Armed Forces. This compensation is the difference between service pay and the amount the employee was receiving when he entered the service. Payment covers a period of one month.

In addition to this, the company pays the premium on government insurance for the service men in proportion to the group insurance he carried through the organization. Also, each returning service man rehired by the company receives $50. So far, 107 persons have returned.

From its nine mills, the company has 1,448 permanent employees and 429 temporary workers in military service; a total of 1,877.

◆

BROWN COMPANY WILL REOPEN AND EXPAND CASCADE PULP MILL

Due to the curtailed supply of pulpwood, the Brown Company, Berlin, New Hampshire, has found that it cannot profitably operate both its Burgess sulphite pulp mill and the Cascade sulphite pulp mill; the latter has been idle.

Future plans of the company have just been announced by F. T. Coburn, president, which plans call for the rebuilding of the Cascade pulp mill. This will concentrate production in that mill which houses four of the company's larger paper machines. The plans also call for the installation of another paper machine in the Cascade mill.

This proposed plan will bring back into production an integrated pulp and paper mill, with all facilities streamlined to economy. The company will continue the production of pulp for sale.

The present estimate for these changes is said to be about $6,500,000, and the company will borrow from the Reconstruction Finance Corporation, $4,000,000 this amount being in addition to the present existing R.F.C. loan.

◆

PHILIP CAREY CO. ACQUIRES PROPERTY OF WARDLOW-THOMAS

Pulp and paper products for war use will be manufactured by the Wardlow-Thomas unit of Philip Carey Manufacturing Company, Middletown, Ohio, for the duration of the war. It is expected after the war that this plant will turn out building materials. Philip Carey Manufacturing Company, with headquarters in Cincinnati, Ohio, recently acquired the Wardlow-Thomas Paper Company, Middletown, which gives the company nine plants in operation.

The new property consists of six acres of ground with a number of substantial brick mill buildings housing two-cylinder paper machines, power plant and coating mill with accessory equipment. Wardlow-Thomas employees will continue under the management of H. L. Brooks, former vice president. Mark A. Thomas, former president and treasurer, will retire.

◆

WAR PRISONERS MAY CUT WOOD IN MASS. AND VERMONT

Shortage of manpower for timber cutting activities in western Massachusetts and southern Vermont, may lead to the establishment of two prison camps in the hill section of western Massachusetts.

Irving Earle of Monroe Bridge, Massachusetts, chairman of the regional Victory Pulpwood Committee, believes that the prisoners could be housed in the abandoned CCC camp in Savoy Forest, and a survey now is under way to determine how many prisoners, with guards, could be housed. It is understood that a prison camp cannot be established for fewer than 250 prisoners, and if this entire number is not needed for timber cutting, it is possible that the idle plant of the American Gypsum Company in Cheshire, Massachusetts, may again be put into operation.

The committee is urging woodlot owners to start cutting their timber and to pile it by the highways so that trucks may pick it up and haul it to the mills.

PACIFIC MILLS CO. AWARDS CONTRACT FOR BLEACH PLANT

General contract for the erection of Pacific Mills' new bleach plant at Ocean Falls, British Columbia, has been awarded to James L. Galloway of Vancouver.

Designed by company engineers at Ocean Falls, plans reveal a four-story reinforced concrete building 43x43 feet, with a flat tar and gravel roof. An expenditure of approximately $40,000 is involved, exclusive of equipment installation. The purpose of the new plant is to improve the quality and color of pulp, and, according to vice president J. A. Young, is merely part of the large construction program commenced some three years ago at the Ocean Falls plant. With completion of the entire project, which is anticipated in the fall of this year, a total of $500,000 will have been expended.

◆

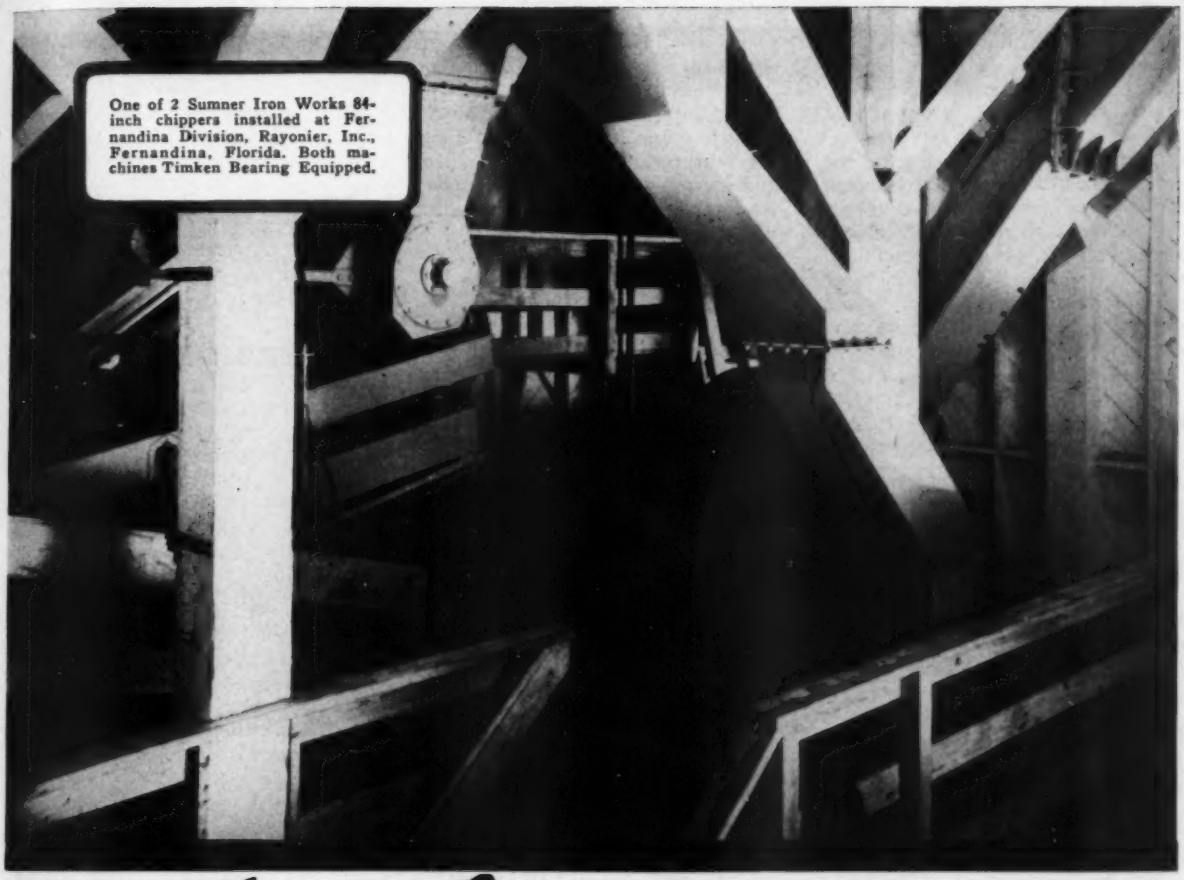
BUSINESS WORKING WITH GOVERNMENT ON QUESTIONNAIRES

More than 30 outstanding economists of American business concerns are working with the Government through the Advisory Committee on Government Questionnaires to advise on the scope and content of statistical information which the Government might make available for the use of business.

At the initial meeting of the Subcommittee in New York City it was agreed that the group first of all should study some of the basic principles underlying Government statistics, including the scope and kind of economic data which government and business need. It is not expected that the new group will get into all the details of what should be made available or how the job should be done, but will deal with major problems on a selective basis and in the main will confine its advice to general recommendations for consideration by the appropriate Government agencies or business groups.

One such question concerns the appropriate line of demarcation between governmental and non-governmental responsibilities for the collection of business statistics. A special group is being organized by the Subcommittee to review this question and to report upon the legal status of private and semi-private statistical activities.

The statistical material available to business and to the general public has been seriously curtailed by the war despite the fact that the Government



One of 2 Sumner Iron Works 84-inch chippers installed at Fernandina Division, Rayonier, Inc., Fernandina, Florida. Both machines Timken Bearing Equipped.

paper production thrives on Timken Bearings

Any paper manufacturer who operates Timken Bearing Equipped machinery knows what a difference Timken Bearings make in speed, smoothness, accuracy, dependability, endurance and economy.

Important as these advantages are now, they will be even more valuable in the era of intensive competition that will follow the transition from war to peace.

Many existing types of paper mill equipment lend themselves to modernization through the application of Timken Tapered Roller Bearings; this will increase their productiveness and give them a new lease of life.

New machines will be equipped with more Timken Bearings as a matter of course, for machine manufacturers know this is one sure way to give their equipment better performance at lower cost for operation and maintenance. Make sure your new machines are equipped with Timken Bearings at every suitable position. The Timken Roller Bearing Company, Canton 6, Ohio.

has collected much information for the administration of the war program. Some of this could now be made available to the public and supplemented in desirable directions if it proves useful. More important, however, is the development of a statistical program for reconversion and postwar periods that will meet the needs of those periods and represent both adaptation and revision of established series and innovations which the changed circumstances have made necessary, or the dropping of those which have lost significance.

◆

CONS. PAPER CORP. FINDS URGENT NEED FOR MODERNIZATION

At the annual meeting of shareholders of Consolidated Paper Corporation, Ltd., Montreal, Quebec, president L. J. Belnap stated that the previously deferred program of modernization and maintenance has become more urgent, due to machinery and equipment becoming obsolete. A market analysis was made of the future demand for products now being manufactured. This seemed to indicate that the continued success of the corporation would depend upon greater diversification, which, in turn, called for new equipment.

Settlement of the Hearst liability for $1,336,388 was also announced through acceptance of ten-year three per cent notes for the full amount under an indenture whereby annual fund payments will be made sufficient to retire the notes at maturity.

◆

▶▶▶ THE NEW TOWN to be created near Peninsular, Ontario, in connection with the new bleached sulphate mill of the Canadian affiliate of Marathon Paper Mills Company (Rothschild, Wisconsin) will be named *Everest,* in honor of D. Clark Everest, president of the affiliate and of the parent company.

◆

CANADA LAUNCHES PLAN TO ERADICATE SPRUCE & PINE WORMS

An extensive campaign is being launched by Ontario's Department of Lands and Forests in an effort to eradicate spruce budworm and jackpine budworm, which already have damaged thousands of acres of spruce and jackpine stands in the province.

Investigations and experiments will be centralized at a Sault Ste. Marie laboratory, and the Canadian federal government will supply scientific personnel for the conduct of the campaign. A $20,000 autogyro dusting program is planned; traps will be installed on aircraft in an effort to gather some of the pests and determine the manner in which they are spread; men will be allocated for special insect surveys, and one man in each forestry department will be assigned to full time work on this problem.

◆

▶▶▶ REPLACEMENT OF approximately 7,200 lineal feet of piping, which carries water to Mersey Paper Company's mill (Liverpool, Nova Scotia) is going forward. The line has reached an advanced stage of deterioration and is being replaced with creosoted British Columbia fir staves. The present bands are being re-used.

◆

▶▶▶ CONSTRUCTION WORK on the new $350,000 creped-wadding mill to be erected at Kapuskasing, Ontario, by Kimberly-Clark Corporation of Canada (Neenah, Wisconsin) will start immediately, according to a recent announcement.

◆

▶▶▶ FIRST PROJECT of the new Mississippi Agricultural and Industrial Commission will be to seek location in the state of a newsprint mill, according to a recent announcement by Governor Thomas L. Bailey, of Mississippi.

◆

NEW POWER PLANT FOR CHEMICAL PAPER MFG. CO. APPROVED

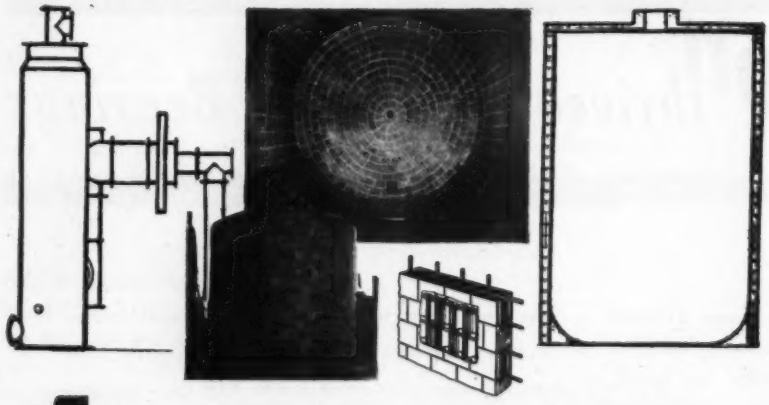
The WPB has approved erection of the first half of the new power plant to be built by Chemical Paper Manufacturing Company of Holyoke, Massachusetts, and the installation of one new boiler.

Complete plans call for a new plant and the installation of two boilers, each with a steam capacity of 60,000 pounds per hour. The entire project entails an expense of $250,000.

The power plant now in use by the company was erected in 1919 and is equipped with three boilers. Completion of the new building and installation of both boilers will afford the company a steam capacity of 120,000 pounds compared with today's limit of 51,000 pounds.

◆

▶▶▶ A $64 QUESTION has been given a four-part answer by the Business Press Industrial Scrap Committee. Q.—Why should industry salvage waste paper? A.—(1) Patriotism; (2) Self-protection; (3) Good business; (4) Streamlined economy.



GOOD LININGS ARE ESSENTIAL FOR
Successful Mill Operation

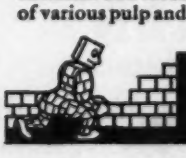
Trouble-free, long-time operation of digesters, clorinators, gas cooling towers, storage tanks, etc. depends largely on the selection of the correct lining.

For sixty years, Stebbins have exclusively devoted their business to solving lining and tile tank problems. Our designers are thoroughly familiar with the chemical and mechanical requirements of various pulp and paper processes. Our erectors know their way about the mills, thus permitting your own men to carry on their own jobs without interruption.

The research program carried on in our own laboratories assures the correct materials to fit the operating condition.

Every installation is covered by a lump sum contract.

When a lining or tile tank job is required, consult Stebbins.



SEMCO
Stebbins Engineering and Manufacturing Company
EASTERN BOULEVARD, WATERTOWN, NEW YORK

On the battlefront, it's refilling the guns. And important too . . . on the home front . . . is the refilling of worn out Jordan plugs and shells. For wavy or corroded fillings cannot assure you of best in quality or maximum production. Keeping your Jordans rolling is essential because paper is vital in the winning of the war.

Fillings provided for all makes of Jordans.

Jones

GEARED FOR WAR PRODUCTION

E.D. JONES & SONS COMPANY-PITTSFIELD, MASS.

Builders of Quality Machinery for Paper Mills

Wright

makes your ceiling your freight clearing yard . . .

For routing and distributing materials, **WRIGHT** Hoists and Cranes convert your plant ceiling into a clearing yard—where vertical and horizontal material-handling takes place speedily, safely and economically. **WRIGHT** Improved High Speed Hoists, **WRIGHT** *Speedway* Electric Hoists and **WRIGHT** Cranes turn idle ceilings into busy, productive areas and save time and money.

Whatever your handling problem may be, **WRIGHT** engineers and distributors are qualified and capable to give you helpful assistance. Look under "**HOISTS**" in your classified telephone directory for the name of your local **WRIGHT** distributor. He is a good man to consult about better material-handling methods in your plant.

WRIGHT
Improved
High Speed
HOISTS

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York

AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT • CONNECTICUT

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

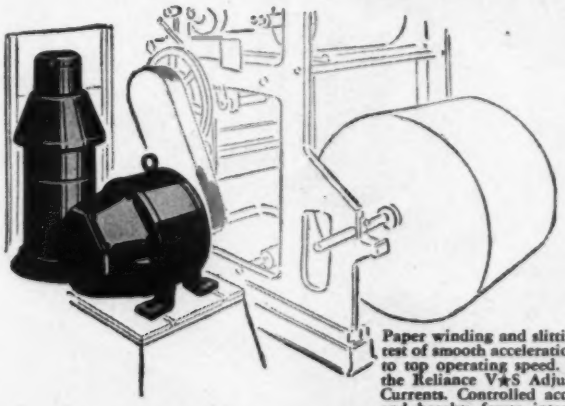
ACCO
In Business for Your Safety

SMOOTH!

Smooth starts, *smooth* acceleration and deceleration, and *smooth* speed changes—all without clutches or brakes—are important characteristics of electric motor-drive. That they can be made to contribute substantially to improved production rates, quality and lower costs has been shown repeatedly by Reliance engineers.

Through pioneering work in many industries, Reliance men have demonstrated that motor-drive, properly applied, can be *more than power*—that, in itself, it can provide for the performance of a wide variety of operations, all with maximum simplicity, efficiency and *smoothness.*

If you would like to invite a Reliance man to come in and talk things over with your own engineers and production planners, please let us know.



Paper winding and slitting operations furnish a real test of smooth acceleration from low threading speed to top operating speed. This is met successfully by the Reliance V★S Adjustable-speed Drive for A-c. Currents. Controlled acceleration helps avoid tears and breaks; fewer interruptions mean more work done; rolls are improved . . . For details of the Reliance V★S Drive ask for Bulletin 311.

RELIANCE A·C D·C MOTORS

RELIANCE ELECTRIC & ENGINEERING CO.

1088 Ivanhoe Road • Cleveland, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S.C.) • Houston • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • San Francisco (Calif.) • Syracuse (N. Y.) and other principal cities.

PERKINS
HOLYOKE
TRADE MARK REG

There is no substitute for Perkins Quality

B. F. PERKINS & SON, Inc.
HOLYOKE, MASS., U.S.A.
LARGEST MANUFACTURERS OF CALENDER ROLLS IN THE WORLD

Standard Coded Lubrication Service

. . . a definite answer to your oilers' question, "Which lubricant to use?"

The best lubricants and the most careful study of where and how to apply them are wasted unless the *right* lubricant is applied to the *right* spot every time it is needed. Worse than that, when lubricants are misapplied, machines may be damaged, time is wasted repairing them, and production drops off. The men in charge of your lubrication can tell you how troublesome this problem is in your plant—particularly today with new men on machines and oiler crews changing continually.

Misapplied lubricants have been as much of a problem to us as to you. For example, our Engineers may work with your plant men to determine the right lubricant for a certain troublesome application. It is found and works successfully for some time. Then trouble suddenly occurs—bearings go out, and a machine is tied up. Perhaps a new oiler was on the job—his instructions might not have been clear—or someone just "forgot" and the wrong lubricant was applied. But before the real cause is discovered—if it ever is—our lubricant is subjected to criticism and you waste time needlessly trying to find another.

Standard Coded Lubrication Service is our contribution towards solving your problem and ours.

The plan is briefly described at the right. Any plant is free to use this system or adapt it to its lubrication program. Plants in the Middle West, whether they use Standard Oil products exclusively or not, can get the materials needed, and the help of a Standard Lubrication Engineer in installing the service. Call the nearest Standard Oil Company (Indiana) office. Say you want to get more information about Standard Coded Lubrication Service. Or write 910 S. Michigan Ave., Chicago 80, Ill. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

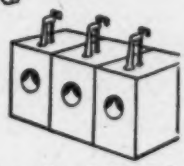
How Standard Coded Lubrication Service works

The first step in the plan is to assign code numbers to each lubricant used in the plant. Lubricants are simply numbered 1, 2, 3, etc. These numbers bear no significance as to type or grade of lubricant. Next, numbered decalcomanias (furnished by us) are applied to:

—every point of lubrication on every machine

—every grease gun or oil can used in servicing equipment

—every container or drum on your lubrication carts where they are used



and every barrel, drum, or storage tank in your oil house.

You can see at a glance that oilers merely need to follow the code number when filling dispensing equipment from storage, and in applying the lubricant to the right place, which is clearly marked to show that lubrication is needed and what number to use.

Machine Record Cards: Where desired, a supply of machine record cards is provided. The card or a copy of it may be kept in office files. This card shows the number of points to be lubricated, lubricants to be used, and lubricating schedules.

Lubrication Chart: For control purposes, a card is provided to list, by brand name and code numbers, all lubricants used in the plant. This card is used by stock clerk or stockkeeper to enable him to requisition products by brand name, and to mark barrels with the correct code numbered decal.

This Booklet gives full details of how Standard Coded Lubrication Service can go to work in your plant. Ask your Standard Oil Man for a copy. Talk it over with him and the men in charge of your lubrication. See how this plan fills a gap in your lubrication program.

Oil is Ammunition . . . Use it Wisely

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATI

MERFENELOPE
Slime Chaser

In a one-ounce sealed envelope. Throw it in the beater unopened

Cleans Pipes
Kills Bacteria
Reduces Washups
Fewer Slime Rejects

R. T. VANDERBILT CO., INC.
230 Park Avenue, New York City

. . . Editorial . . .

A New Setup Needed for Raw Material Supplies

▸▸▸ CONDITIONS IN THE paper industry are becoming more and more acute. The acuteness comes from the steadily decreasing supply of raw material pulpwood and wastepaper collections.

In turn, these decreased supplies are occasioned by the lack of manpower—men needed to cut the wood, and men needed to man the junk yards, pushcarts and collection systems of wastepaper collections.

And, in view of the outstanding demand for some six million more men this year, for the armed forces and civilian industry, there appears to be scant hope of any adequate manpower being diverted to the procurement of raw material wood pulp supplies.

Since 1869, when pulpwood was first reported as a raw material in the production of paper, until 1941, the yearly cut of pulpwood was made by men who were born, reared and schooled in forest lore. They were the woodsmen of this country, and in 1939 there were approximately one million men so employed. Then, came the "call to arms" in 1941.

The selective service, through the draft boards, drew immediately, heavily and continuously upon the strong, sturdy woodsmen who were preferred inductees for the Armed Service.

Where are the men coming from to produce the essential pulpwood in 1945?

The essential system of wood supply for lumber and paper which grew up with the trees, and which for eighty-five years was the basic raw material supply, to the sixth largest tonnage industry in the country, is disorganized.

The WPB says we must have an average of 666,000 tons per month of wastepaper to keep the mills running on essential production. The collections have been running well under 600,000 tons per month for the first four months of this year.

The basic problems on wastepaper supply are man shortage and OPA ceilings. The collection, sorting, grading, and distribution of wastepaper to the mills has always been handled effectively by men, junk dealers, pushcart operators, and collectors. The selective service got the able-bodied; the OPA ceiling took the profit out of the business, and the war industries offering big pay got the rest. The paper industry must rely solely on patriotic appeals made to the citizens, Boy Scouts, school children, and like groups to keep the diminishing supply moving.

Some day, there will come a collapse in these inadequate sporadic efforts, and mills will be forced to close. What is needed is a new business system setup. That paper products are most essential to both the war and civilian economies, we are soon to find out.

Things To Be Done After the War

▸▸▸ SOME OF THE THINGS which must be done by the pulp and paper industry in the postwar period were brought out by D. C. Everest, president of Marathon Paper Mills Company, Rothschild, Wisconsin, in an address before a joint meeting of the Northwestern Division of the American Pulp and Paper Mill Superintendents Association and the Lake States Section of the Technical Association of the Pulp and Paper Industry on April 22, 1944, at Wausau, Wisconsin.

Since the postwar problems of industry are uppermost in the minds of so many thinking people, it is believed that some of Mr. Everest's remarks pertaining to the things which must be done then by pulp and paper mill organizations will prove of interest. Here they are:

"The first, and I believe the most important of all, will be the re-employment of those who are in the Armed Services. This will be a job of no mean proportions. It will require much thought. We have two obligations: One to the draftees, which *is* an obligation under the Selective Service Act, and also to those who enlisted; and the other to those who have remained with us or have been employed during this period. I believe that personnel departments and local unions must co-operate in the closest manner to avoid as much dislocation as possible in employment. With a global war, such as we have today, I am sure that the return of men to industry will cover a considerable period of time and this undoubtedly will make this problem less difficult.

"The second thing which I believe is also important is the continuance of some form of price control under the Office of Price Administration until inventories have been restored to somewhere near a normal basis. While I disliked the thought of 'price controls' in the early days as much as anyone, I now feel that it is a necessity for some time to come or until inventories are on a reasonable basis. . . .

"The third thing is the rehabilitation of our plants. For three years, we have had little chance to make repairs except in a minor way and through the scrap heap and our own machine shops. There will come a time when machinery manufacturers will encounter terminations of contracts and then there will be an opportunity to get release of critical materials and shop service. I believe engineering departments should have plans ready for whatever they require against that time.

"The fourth thing is to maintain your relationship with pulp producers and wastepaper dealers on the North American Continent. The fear of an avalanche of wood pulp descending on this country at the cessation of hostilities in Europe or at any other time for years to come is pure bunk. The basis of our business is *Wood*, and the basis of pulp production in Europe is also *Wood*. During the various conflicts which have been raging in Europe for nearly six years, the wood supply of all the countries invaded has been tremendously affected. Those European forests were mostly on a sustained yield basis and the drain has been away beyond anything like normal years, and many forests have been completely destroyed through military action. It is only logical that such pulp as is available for paper and paperboard use will go to England and other European countries. Another factor will be rayon manufacture of which there will be great need in the textile industry."

Current Thought

WILLIAM SIBLEY

Disposing of Surplus War Goods

▶▶▶ WHAT WILL BECOME of the huge stores of surplus war goods?

Those of us who were in business during 1918, '19, and '20, remember too well the tangled market condition resulting from government dumping of around seven billion dollars worth of unused war goods. Then, conventional business channels were disregarded. The small businessman had no voice. Cut prices were the rule. This was the case for everything from G. I. raincoats to locomotives.

Today, estimates on stores which must be disposed of run to ten times that of 1918. A Damocles sword for small and large business alike unless the whole setup is properly handled.

A recent government announcement reveals that cars and trucks listed as "surplus" are to be disposed of now. The plan is under the management of John L. Sullivan, Assistant Secretary of the Treasury. The section for handling distribution is the Treasury Procurement Division. Other government agencies will handle the disposition of other surplus properties, such as The Reconstruction Finance Corporation for capital goods, The Maritime Commission for ships, and The War Food Administration for food commodities.

The Surplus War Property Administration has been working on the distribution plan. Testing prices, market values, and possible demand, in order to establish fair selling prices.

The OPA, by instituting a WGO (War Goods Office) hopes to establish price ceilings, or control rulings for all surplus war goods except surplus foods. According to present plans, WGO will set price ceilings as follows:

1) If the OPA has established a ceiling price, then that price and existing regulation will serve for the branch WGO.

2) If there is no established OPA ceiling price, the first consideration will be: what did the item cost the government?

3) If the item comes under the list of those which will have to be replaced by the government before the end of the war, then this replacement cost will become the determining factor.

4) For goods which cannot conveniently come under the above, the officer in charge of making the sales will request a ceiling price from the OPA.

Newspaper releases from the War Goods Office indicate that a part of the plan calls for seeking advice from small and large businessmen over the country, and from business and trade associations. Associations and trade groups are urged to "feel out" their members for ideas and plans so that their reports will show a cross-section of member opinion.

As a prod, and working along with with the organization already set into motion, the legislative bodies at Washington (House and Senate) have been working on future distribution planning. There are bills now pending in both houses designed to speed war contract settlements and smooth the disposal plans for returning surplus goods. All this is a start in the right direction.

However, in addition to such plans I would suggest the addition of a definite advertising campaign on the part of government. What private business with even one per cent of a hundred-billion-dollar volume would try a distribution program without national advertising?

Explanatory articles, newspaper releases, and bulletins—sure. But full-page advertisements, starting with business and trade papers. Let these ads stress not only available goods, but plans of selling them. The copy should be handled deftly if best results are to be obtained. Let newspaper copy be a message to the consumer. Wholesalers who sell direct to large users could follow up with surveys and bulletins based on this copy.

In general, I think the best policy is to return surplus goods to the manufacturer. Let him sell through his jobber to the user. Perhaps this cannot be worked out in all cases. But regardless of case, the cards should be put on the table, face up. This was not done after the last war.

A recent release from the War Goods Office read something like this:

"Disposing of surplus war goods, now and after the war is over, should take into consideration the people who are set and established to perform such a distribution service the nation over. These men and firms should be allowed to make a fair profit of such distribution. The profit should be such that any study will bring out fairness to all. The manufacturer, the distributor, and the user.

"Such commodities should be disposed of in lots of size which will give the small retailer or distributor the same opportunity to fill his requirement needs as the large distributor or jobber. . . . ."

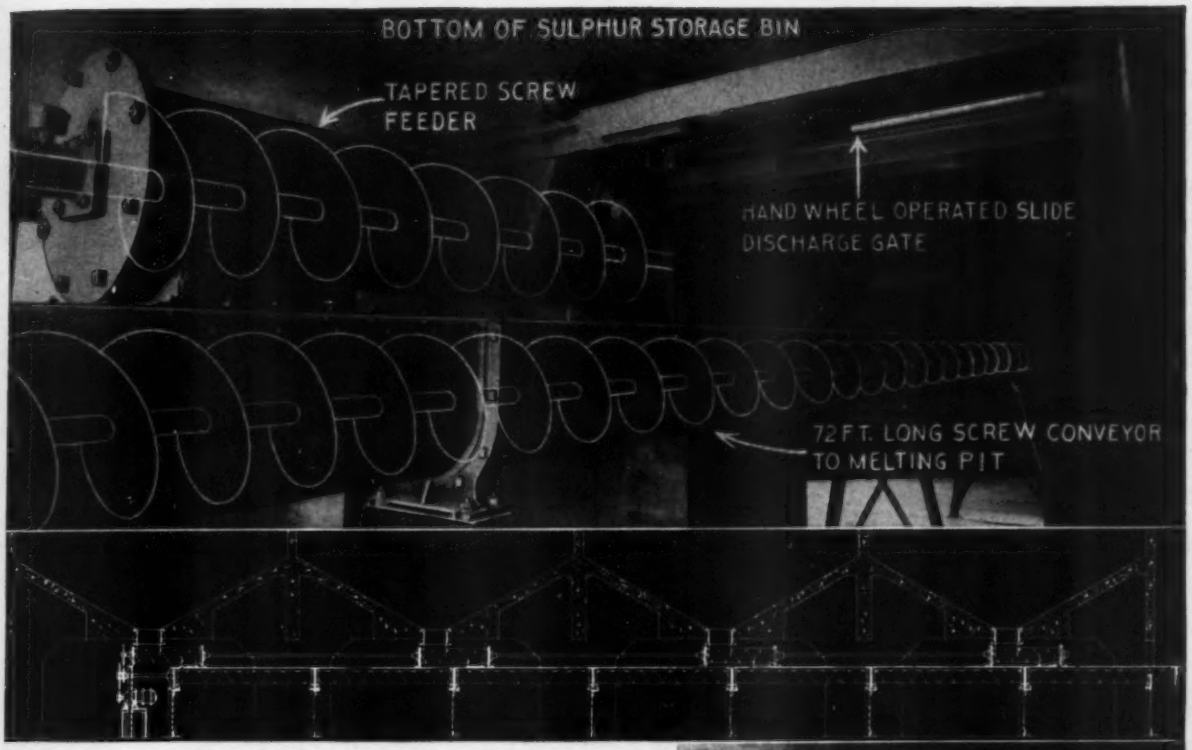
To this I would like to add—*And the best way to be sure that this plan is carried out is to work with those now established in the manufacture and distribution of such materials, and to put the cards face up on the table through an advertising campaign.*

"But there is nothing I can do about it," I have been told by friends. That attitude is wrong. A lot can be done.

The individual can read everything he can find on disposition of war surplus; he can contact his customers for plans and suggestions; he can encourage his representatives in Washington to urge speed and reduction of red tape. And he can howl long and yell loud if early experiments in disposition indicate a policy similar to that used after World War I.

On the other side, if early sales indicate that the program is being properly handled and the cards are put face up through an advertising campaign, the individual can accomplish still more by conducting a one-man campaign of congratulations. Nothing pleases so much or brings as many top repeat performances as "You're doing a swell job—keep it up!"

Screw Conveyor Handles Sulphur Efficiently at Puget Sound Pulp and Timber Co.


BOTTOM OF SULPHUR STORAGE BIN
TAPERED SCREW FEEDER
HAND WHEEL OPERATED SLIDE DISCHARGE GATE
72 FT. LONG SCREW CONVEYOR TO MELTING PIT

Reclaiming sulphur from storage bins and delivering it to the melting pits is done by this compact, low-headroom arrangement of screw conveyors at their Bellingham, Wash., sulphite pulp mill.

Under each bin there is a slide discharge gate and a screw feeder. Four of these feeders with continuous drive shaft serve the 72-ft. long screw conveyor discharging at end to a turntable-mounted weigh hopper, and then to melting pit.

Everything is enclosed, and one motorized reducer with roller chain drive operates both the four feeders and the 72-ft. screw conveyor. A duplicate arrangement serves another set of four bins.

Link-Belt makes all types of screw conveyors —the practical conveying medium for horizontal, vertical or inclined plane. Send for Book No. 1289.

BUY that War Bond TODAY

Upper: Close-up of discharge gate, tapered screw feeder and portion of 72-ft. long screw conveyor. Lower: Drive end, showing how feeder screws and 72-ft. long screw conveyor are operated by one motorized reducer and roller chain drives.

9385

LINK-BELT COMPANY

Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Minneapolis 5, Dallas 1, San Francisco 24, Toronto 8. Offices, warehouses and distributors in principal cities.

LINK-BELT *Screw* **CONVEYORS**

COLLARS • COUPLINGS • HANGERS • TROUGHS • BOX ENDS • FLANGES • THRUSTS • DRIVES

Chicago Plants
Indianapolis Plant
Ordnance Plant

We're just little people

We're not brass hats.
We're not big shots.
We're just plain folks . . . but
We're the folks who made this country!
And we're the folks who will save it!

Save it from *two* things it's *got* to be saved from now.
The first thing is the Enemy. The second's
something that doesn't look very dangerous, but is.
It's the danger of Prices Getting Out of Hand.

Here we are this year—after we've paid our taxes—with
131 billion bucks in our pockets.
But only 93 billion dollars' worth of goods to buy.
That leaves 38 *extra* billion dollars.

Sure, the easy thing to do is to take that 38 billion
and start running around buying things we don't need,
bidding against each other . . . forcing prices up and up!

Then people want higher wages. Then prices go up some more
—and again wages go up. So do prices again.

And then where are we!

But us little guys—us workers, us farmers, us businessmen
—are not going to take the easy way out.

We're not going to buy a single, solitary thing that we can
get along without.

We're not going to ask higher wages for our work,
or higher prices for the things we sell.

We'll pay our taxes willingly, without griping . . .
no matter *how much* in taxes our country needs.

We'll pay off all our debts now, and make no new ones.

We'll *never* pay a cent above ceiling prices.
And we'll buy rationed goods only by exchanging stamps.

We'll build up a savings account,
and take out adequate life insurance.

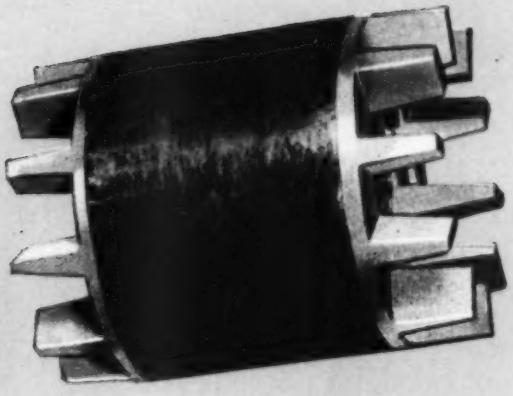
We'll buy War Bonds until it pinches the daylights
out of our pocketbooks.

Heaven knows, these sacrifices are chicken feed,
compared to the ones our sons are making.

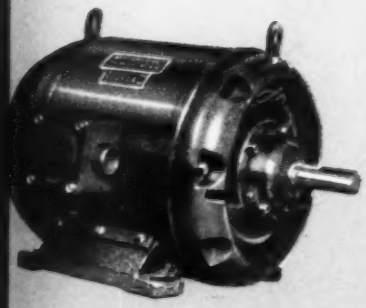
Use it up . . . Wear it out.
Make it do . . . Or do without.

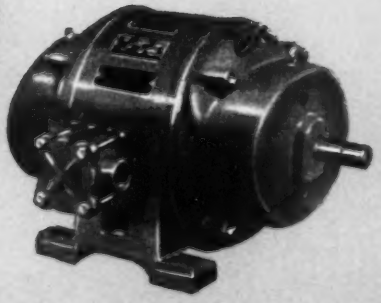
HELP US KEEP PRICES DOWN

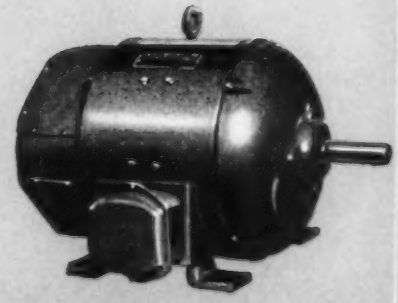
A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by the Magazine Publishers of America.



There is a size and type ***LOUIS ALLIS*** *electric motor for every industrial requirement.*







THE LOUIS ALLIS CO., MILWAUKEE 7, WIS.

Our Obligation To Industry

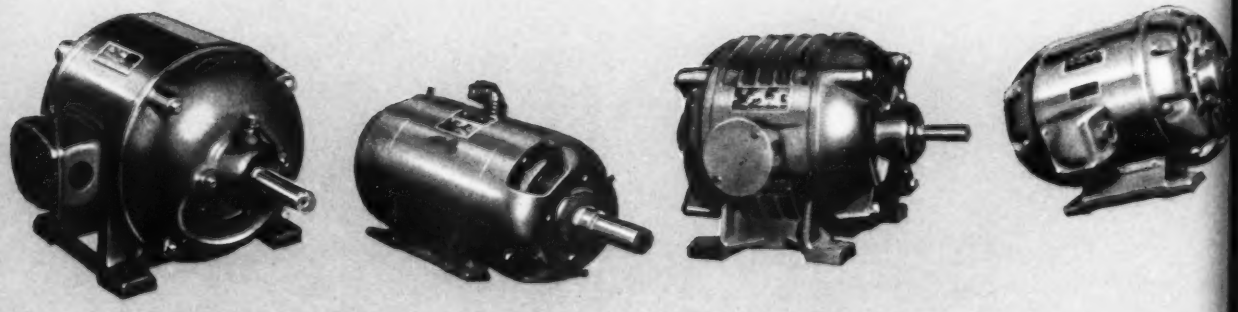
As a manufacturer of electric motors, we feel that we have a unique obligation to industry, for it is industry that creates our market for us. Our motors by themselves can't turn metal, process materials, nor drill oil wells, but properly applied to your equipment they can do all these things and many more.

For years it has been our privilege to sit in with many of our friends on their initial discussions for designing devices to increase production. We have truly acted as their confidential electrical consultants.

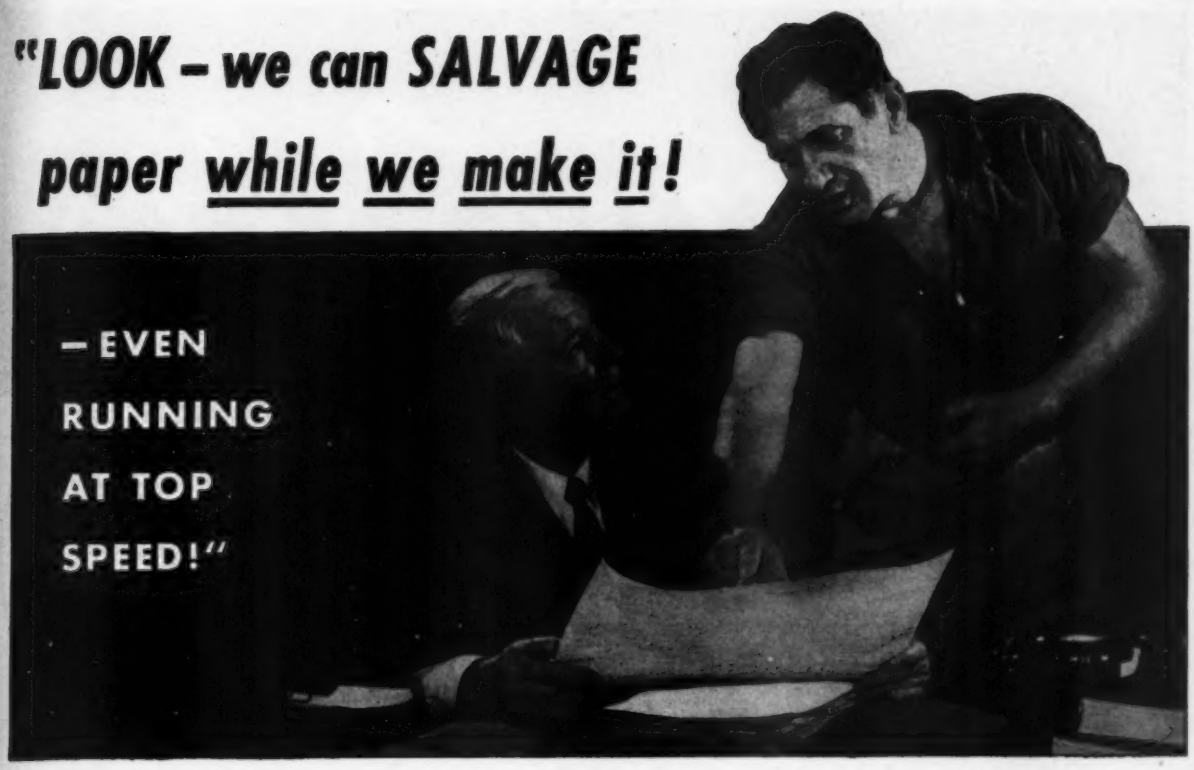
In such circumstances, our obligation is clear. We must do more than design and apply motors for maximum results at minimum cost. Above all, we must and do treat with utmost confidence the information gained through being in on the original development. At all times we must and do remember that companies who have sought our advice are developing business for us. The best interests of such customer friends are our paramount responsibility.

You can place your electric motor development problems with our engineers in complete confidence —your inquiry is invited.

THE LOUIS ALLIS CO., MILWAUKEE 7, WIS.



"LOOK – we can SALVAGE paper while we make it!



EVERY MILLMAN knows the facts. Paper and paper board stocks used up faster than they can be produced. Inventories close to bottom. Pressure on farmers to cut more wood for paper mills—on users to conserve more paper—on mills to produce more paper. *Now what else can the mills do to improve conditions?*

MILLS—as well as users—can conserve paper—conserve it by conserving the valuable materials that go into paper—preventing spoilage at every step of pulp-making and sheet formation with "bubble-busting" Nopco KF.

NOPCO KF facilitates *volume production* and *protects quality*, too. It assures uniformly fine sheet formation, even with machines running at capacity. At increased machine speeds, entrained air—the common cause of thin spots—is dissipated as effectively as if the stock was being handled at slower speeds. Why? Because Nopco KF keeps "working" *even on the wire.*

53% Fewer Thin Spots

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Fig. 457—All Iron Globe Valve for 125-pounds W. P. Has flanged ends, outside screw rising stem, bolted flanged yoke and regrindable, renewable iron disc. Steel stem. Sizes, 2″ to 10″, inclusive.

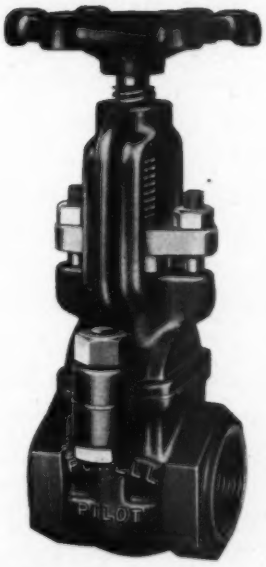

Fig. 480—All Iron "Pilot" Gate Valve, with screwed ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc. Available in sizes, ½″ to 2″, incl., for 150-pounds W. P.; 2½″ and 3″, for 125-pounds W. P.

Fig. 1816—All Iron Gate Valve for 125-pounds W. P. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc. Sizes, 2″ to 30″, inclusive.

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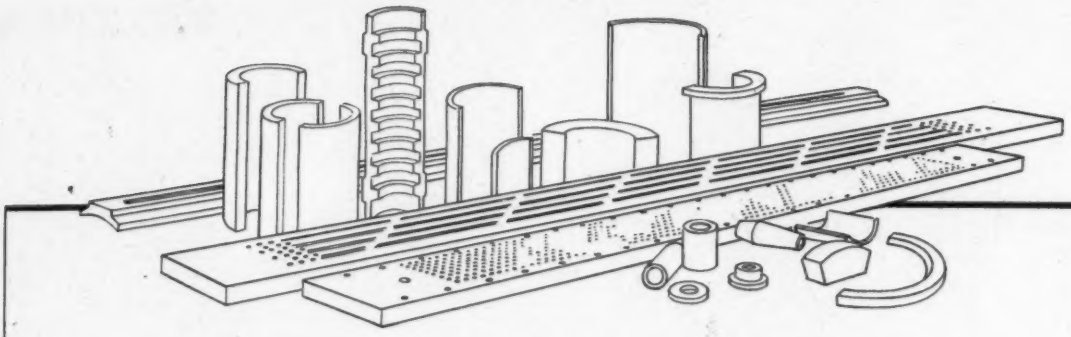

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Starch Dispersions *for Paper Mill Use*

JAMES P. CASEY
A. E. Staley Mfg. Company

▸▸▸ THE AMOUNT OF STARCH used by the paper industry has shown a steady increase during the past decade. Appropriately, the paper mill technical man has shown a steadily increasing interest not only in starch technology but also in the fundamental research on starch that has been so abundant in the past few years.

In the first part of this article, the preparation of starch dispersions is described from the theoretical point of view; and theory is presented indicating the importance of thoroughly dispersing starch in water for best results. In the second part, the practical application of starch dispersions to paper mill operations is discussed with emphasis on those factors which favor the use of highly dispersed colloidal solutions of starch. Since some of this material is undoubtedly controversial, the subject matter is left open for more investigational work and further discussion.

Historical

Starch was the earliest sizing agent used in paper manufacture; there is evidence that it was employed in Chinese documents dating as far back as 312 A.D. Starch sizing probably originated in China and subsequently spread westward through India, Persia, and Arabia. Examination of papers made in these countries during the 8th and 9th centuries shows that starch had been used in high proportion as both a sizing and filling agent. Later on, the use of starch apparently decreased, but within modern times it has reappeared to assume again a highly important place in the paper industry. The diversified use of starch in modern papermaking has been made possible through the large number of modified starches that are produced today. The recently acquired knowledge of starch modification has made it possible to adapt native starch to the fulfillment of the different functions of a laminating glue, sizing agent, and pigment binder.

With the increased use of starch in papermaking, the paper mill chemist gradually has become familiar with the characteristics of the various forms of modified starch and he has even entered the field of starch modification himself by preparing enzyme converted starches under his own supervision.

For industrial uses, such as those in the paper mill, starch is usually applied in the form of a colloidal dispersion in water; consequently the proper preparation of such a dispersion is of prime importance to the user. The preparation of starch dispersions is a very simple process and for the most part is carried out satisfactorily, but there is much that is still unknown about starch dispersions in spite of the abundant research work that has been carried out; and it is the purpose of this paper to point out possible refinements in this technique, which paper chemists might consider as a means of improving the practical operation of their starch.

Chemical and Physical Properties

Like cellulose, starch is a carbohydrate consisting of a chain of glucopyranose units linked together through oxygen units. In cellulose the type of linkage is such that the resultant molecule is a long, straight chain. In starch, the principal constituent seems to be arranged in the form of a highly branched chain. The present school of thought favors the theory that most starches are composed of two major constituents, one a highly branched chain and the other a straight chain molecule. The generally accepted ratio for native corn starch is roughly 80 per cent branched chain molecule and 20 per cent straight chain molecule.

The analogy between starch and cellulose can be extended further to include the method by which their molecules are associated to form their respective crystalline structures. Both of their molecules have a large number of hydroxyl groups which are undoubtedly the center of molecular cohesive force responsible for the configuration of each carbohydrate. In cellulose the molecules are arranged in parallel fashion and stabilized laterally by secondary valences between opposing hydroxyl groups to form micelles or crystallites. In turn these crystallites are aggregated in an orderly arrangement by molecular cohesion to form threadlike filaments, or fibrils. The final building units, the fibrils, are then arranged approximately parallel to each other and are orientated in a characteristic manner to form the cellulose fiber. In an analogous manner, the starch molecules are arranged through the same sort of physical or associative bonds to form oriented groups, also called micelles, which are further associated in concentric and radial arrangement to form the starch granule. The particular conformation of the starch molecule with its highly branched chain permits a high degree of aggregation and under such conditions the associative forces of adjacent molecules are mutually satisfied to the extent that a highly stable granule results.

The above is a much simplified picture of the structure of starch and cellulose. It does serve, however, as a working hypothesis to explain most phenomena, and to show the similarity between these two carbohydrates, which makes starch such a natural companion for cellulose.

In papermaking, it is the physical form of the fiber which is important, and, insofar as it is compatible with other properties desired in the paper, an effort is made to preserve the fiber structure. Some separation of the fibrils, or fibrillation, is necessary to expose surface within the fiber structure; this development of external fiber surface is the essential action of the paper mill beater and is developed differently in individual papers, depending on the amount of cohesion desired in the paper. Unlike the cellulose fiber, the physical form of the starch granule, which is usually round or polygonal, is not useful except in rare cases when it is used simply as a filler. Since all the potentially adhesive forces of the hydroxyl groups are locked within the granule, just as those inside the fiber before fibrillation, the granule as such has no adhesive properties. To develop adhesiveness, it is necessary to disrupt the starch granule and break up the cohesive

aggregates of starch micelles. This is accomplished by thoroughly cooking the starch in water.

Corn starch granules range from 10-25 microns in diameter and corn starch products always show about this variation in granule size. Since the starch granule has been compared above to a cellulose fiber, Figures 1a and 1b compare uncooked native corn starch granules with unbeaten sulphite fibers to give an indication of their relative size and shape. For the most part, modified corn starch products show the same granule structure, even though the chemical structure has been changed, and this is illustrated by Figure 1c for a highly oxidized starch product.

Preparation of Starch Dispersions

Swelling

When a suspension of starch in water is heated, the granules begin to swell perceptibly usually starting with the larger granules first, after the temperature has reached a certain point. This point of incipient gelatinization depends on the rate of heating and the modification of the starch. Particularly, dextrinized and oxidized starches show a decided shift to lower pasting temperatures, the shifts being progressive with increasing degree of modification. At this point in the cooking, the internal structure of the starch granule will have been disturbed and internal stresses relieved, as evidenced by the granules having lost their characteristic birefringence under polarized light. As the heating progresses, the granules continue to swell, until their refractiveness is reduced to such an extent that visual observation or photographic reproduction becomes unsatisfactory.

Granule Disintegration

At this point of maximum swelling, granule disintegration takes place, the degree depending on the method of heating, type of modified starch, and the amount and type of agitation applied to the paste. Although complete disintegration of unmodified corn starch is not easily accomplished, those starches modified by acid treatment, and particularly oxidizing and dextrinizing treatment, show a much greater tendency toward disintegration of the granule. Complete disintegration of the granule, and dispersion of the starch to an aggregate of micelles, is theoretically desirable since this makes available for adhesive purposes a greater number of hydroxyl groups.

The viscosity of the starch paste begins to develop when the granule first begins to swell, and much of the viscosity of the starch paste must be attributed to these swollen granules or fragments of the granule structure. Since mechanical agitation tends to disrupt these granule structures, it brings about a reduction in the viscosity of the starch paste until a minimum constant value is obtained. Prolonged heating also brings about a reduction in the viscosity, but degradation of the starch molecule through hydrolysis is undoubtedly a factor in this treatment. This hydrolysis lowers the adhesive properties of the starch molecule and should be kept at a minimum by heating the starch in the range of maximum stability, which is generally considered to be a *p*H range of 5.9 to 6.3.

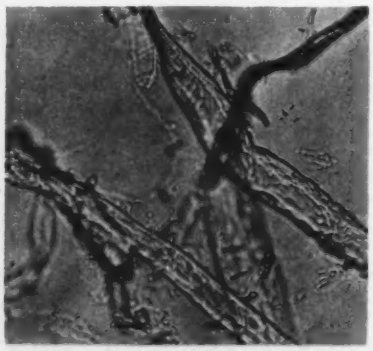
In Figures 2a, 2b, 2c, and 2d, there are shown unmodified corn starch granules in various stages of gelatinization from the initial stage where the granules are unswollen, to the point, after boiling for 30 minutes, where they have swollen to many times their normal size. To illustrate the fact that certain types of modified starch will disperse more readily than unmodified starch, the preceding cooking conditions were repeated in Figures 3a to 3d using a highly oxidized starch. As can be seen from the photomicrographs, the oxidized starch is completely dispersed at an early stage in the cooking.

One of the big factors in granule disintegration is whether direct or indirect heating is used for cooking the starch. A steam line with small outlets exhausting directly into the starch paste brings about a more rapid and complete granule disintegration. The type of agitation, *p*H, presence of dissolved salts, and particularly the type of modified starch used are other factors affecting the amount of granule disintegration.

Retrogradation

Once the starch paste has been prepared in a highly dispersed form, it is desirable to keep it in that condition until used. Retrogradation of starch, or the tendency to revert to a less soluble form, is favored by low *p*H and long periods of aging, and proceeds more rapidly at high concentrations, and low temperatures. Highly dextrinized or oxidized starches show much less tendency to retrograde than unmodified starch since their dispersibility has been greatly increased in modification. The viscosity characteristics of a starch paste are greatly affected by the associative tendency of starch molecules to rearrange themselves into a definite structure. When this takes place to a great extent, there is an unnatural build-up in viscosity in concentrated pastes and often a stiff gel results; in more dilute pastes a fine crystalline precipitate will form resulting in an opaque paste. This unnatural build-up in viscosity is an undesirable characteristic of paper mill applications where the flow properties are of notable importance, such as in pigment coating mixtures. Oxidized, dextrinized, and enzyme converted starches show the least tendency in this respect.

There is much of theoretical interest in this field of retrogradation, but from the standpoint of practical results in the paper mill, little has been accomplished. Some interesting experiments can be carried out. Taking a highly oxidized starch, a type which is least likely to show retrogradation, and heating to the boiling point in water, two entirely different solutions can be pre-



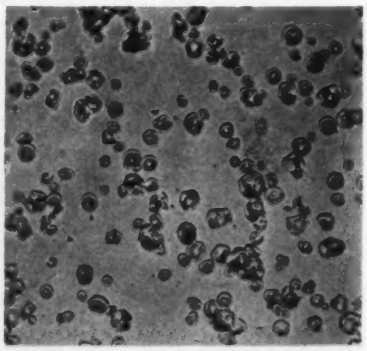
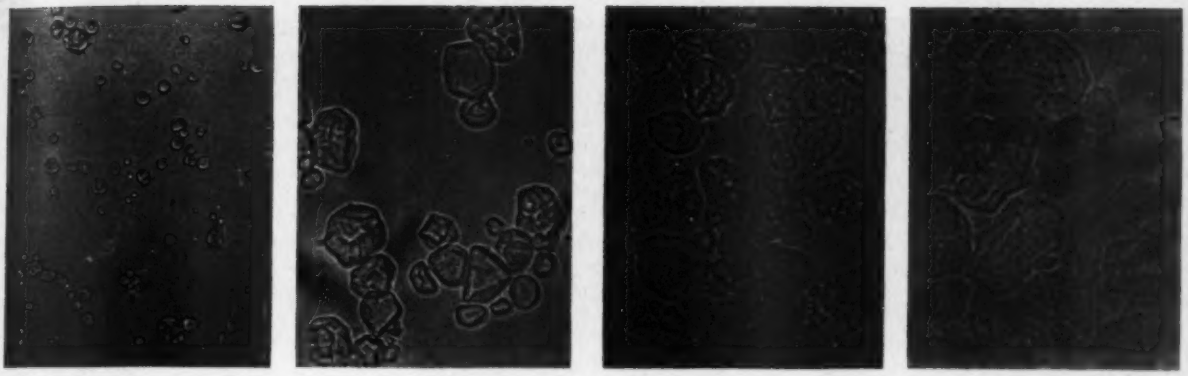


Fig. 1a (left) Unmodified corn starch granules (uncooked). Fig. 1b (center) Bleached sulphite fibers (unbeaten). Fig. 1c (right) Highly oxidized corn starch granules (uncooked). All 210X.



Left to right: Fig. 2a, unheated; Fig. 2b, heated to 175 Fahr.; Fig. 2c, heated to 200 Fahr.; Fig. 2d, boiled 30 minutes. (Figures 2a to 2d, unmodified corn starch. All 210X.)

pared, depending on the method of dilution. If one sample is immediately poured into a large volume of cold water, a water clear solution results. If the other sample is allowed to cool gradually to room temperature before pouring into an equal volume of cold water, a very opaque solution results. Whereas the first solution is optically clear under the microscope at medium magnification, the latter shows a definite structure. This is a retrogradation phenomenon. Theoretically, the first method of preparation should make a more effective size since the starch is obviously in a more highly dispersed state. Another interesting test is to prepare an oxidized starch paste at high solids and allow one sample to cool gradually while the other is cooled in a few seconds by running through an efficient heat exchanger. Profoundly different dispersions are obtained. Other possibilities in this field are the use of dispersing agents in starch pastes to effect more completed dispersion and prevent retrogradation on cooling and aging. The use of urea formaldehyde condensates for stabilizing starch pastes to attain viscous rather than plastic flow in dispersions of high concentration is covered in a recent patent (*1*).

Summary

Summarizing the steps in the preparation of starch dispersions, the first consideration is to select the proper type of modified starch on the basis of laboratory results or through consultation with the starch manufacturer. Secondly, the cooking conditions should be regulated to insure as much disintegration of the starch granule as practicable and dispersion into the smallest unit structure without undue loss in intrinsic adhesive value through hydrolysis. Complete dispersion of the starch granule makes available the maximum adhesive forces of the starch and inhibits the build-up of undesirable structural viscosity in the finished paste. The final consideration, after the starch dispersion has been properly prepared, is to prevent excessive reassociation or retrogradation of the starch paste since this tends to reduce adhesive properties and favors undesirable structural viscosity.

Practical Applications

Beater Sizing

The subject of starch beater sizing is a complicated one, dependent on many factors. While it is generally true that a highly dispersible starch, such as an oxidized starch, will produce higher physical tests than a difficultly dispersible starch, e.g. unmodified starch, there is a school of thought which holds that a starch should not be too highly dispersed for best results. This group advocates the use of unmodified corn starch added at the beaters in a slightly swollen condition; and there are practical results which substantiate this theory under some conditions. The advantages claimed are (1) the amount of starch retained in the sheet is increased, and (2) these large, swollen granules when further heated on the paper driers form highly adhesive areas, which "spot-weld" the fibers at their points of contact.

The other school of thought favors the use of highly dispersed starch solutions. The adherents to this theory feel that it is desirable to have a uniform layer of starch micelles, colloidally adsorbed on the fiber surface, which would form a semi-continuous film with increased fiber-to-fiber bonding. Such a system might be easily disturbed by action in the beater or jordan, and for this reason it is probably better to add the starch just before sheet formation, preferably at the fan pump, when using highly dispersed starch solutions. These ideas have been expressed previously by others (*2*). Lee (*3*) has pointed out and illustrated with photomicrographs that heating of the sheet on the paper machine cannot be depended upon to produce good dispersion of uncooked beater starch. He further proved that the amount of starch that is dispersed throughout the sheet and uniformly distributed on the fibers is greatly influenced by the degree to which the starch is cooked before addition to the beater.

When starch is used in heavily loaded papers to prevent dusting, the importance of having the starch in a highly dispersed condition is increased. There will be more uniform pigment bonding, and consequently less dusting, if the starch is thoroughly dispersed before addition to the furnish.

In many cases an oxidized corn starch is used in the beater to increase the effect of rosin sizing. For this purpose the starch is best added after the rosin and before the alum so that the starch will be present to serve as a protective colloid when the rosin is precipitated on the fibers. When starch is used as a protective colloid in this manner, the importance of having the starch solution in a highly dispersed form is obvious. Fortunately, oxidized starches are rarely under-cooked since that type is one of the easiest to disperse. However, improved methods of dispersion, resulting from a theoretical study of the problem, should be particularly worthwhile for this starch application, and further investigational work along this line should be carried out in the future.

Starches have a decided affinity for certain dyestuffs, and it has been reported (*4*) that this sometimes results in a high degree of two-sidedness on colored sheets. While this is undoubtedly an infrequent occurrence, it is conceivable in cases where the starch granule has been incompletely disintegrated and contains a preponderance of whole or partially disrupted granules, which would attract the dyestuff and later be unevenly distributed in the sheet under the high suction at the couch roll. Starch added at the beater in the uncooked condition would

be most likely to cause this condition (*3*). Undispersed starch granules might tend to concentrate on one side of the sheet, and possessing a strong attraction for the particular dyestuff in use, cause appreciable two-sidedness. On the other hand, it is not difficult to imagine that a completely dispersed starch, properly adsorbed on the fibers in a uniform film, would result in a more uniform dyeing.

Surface Sizing

Most paper mill chemists realize that starch should be thoroughly cooked when used as a surface size in the tub or on the calendar stacks, but there appears to be wide disagreement as to what constitutes proper cooking. In some mills, the cook is subject to control by visual observation of the man in charge; in others it is regulated by temperature control using industrial thermometers. While the results may be acceptable, there is no assurance that they are the best obtainable. Although it can be demonstrated that a starch dispersion containing starch granules which are little more than swollen will produce nearly as much in binding properties as a completely dispersed starch dispersion, continuity of film requires a homogeneous dispersion free from large undissolved particles. A uniform, continuous film of starch probably does not exist on commercial tub-sized paper, but a certain measure of uniformity is to be expected when relatively large amounts of properly prepared starch are applied. The presence of undisintegrated granules would break up this film-like form, and also result in uneven penetration into the paper; both of these factors detract from the effectiveness of the writing surface. It is also possible that slight picking on the dryers and calenders might be caused by the presence of large swollen granules retained on the surface of the paper.

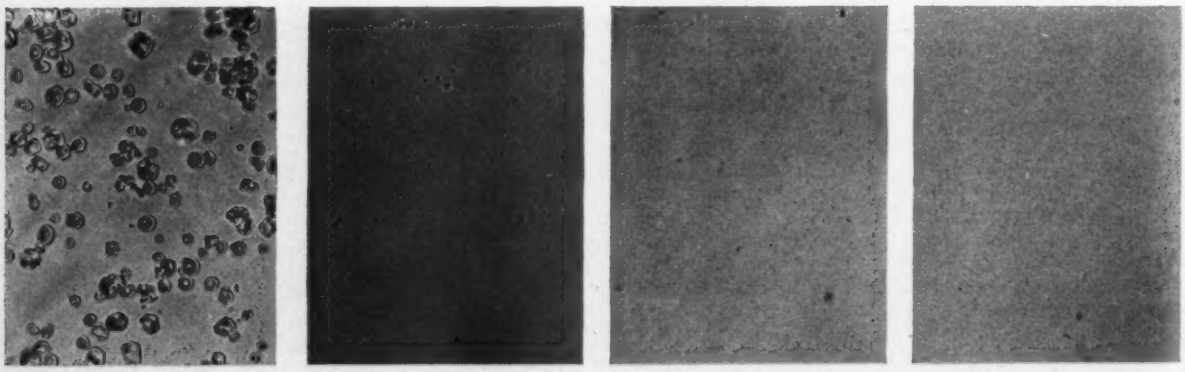
One of the recent developments in starch technology has been the use of starch with certain synthetic resins, notably the urea-formaldehyde and melamine-formaldehyde types, to secure increased water resistance in the starch films. There is considerable evidence to indicate that urea-formaldehyde condensates react with starch to form a new compound different from either of the original reactants. Since the importance of particle size and external surface in chemical reactions and adsorption phenomena is well recognized by colloid chemists, definite improvement in the reaction between starch and these resins should result by having each reactant in as fine a state of subdivision as possible.

Retrogradation of starch is a factor to be considered when starch dispersions are prepared for use. Metallic ions such as calcium or barium favor retrogradation consequently this factor becomes of increasing importance whenever extremely hard waters are used. Some paper mills using hard water have found that the effectiveness of cooked starch added to the beater is increased if the starch is added after the alum. Another paper mill (*5*) noticed that if its calender starch was made in large quantities and recirculated for a long time, the alum leached from the paper caused a gradual drop in *p*H until precipitation took place. As a result the starch lost its effectiveness. The remedy for such a condition is to make smaller batches or to maintain the *p*H nearer the neutral point by addition of alkali to inhibit retrogradation.

Coating

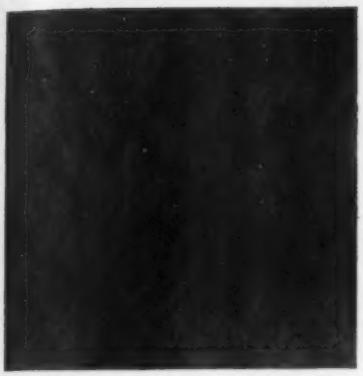
There is some experimental evidence to indicate that the presence of swollen, but undisintegrated, starch granules in coating mixtures are harmful to the printing qualities of the coated paper. The effect of these undisintegrated starch granules in the coated sheet parallels that of "fish-eyes" resulting from the use of improperly cut casein, although to a lesser extent. These swollen starch granules, which are many times their original size, occupy a relatively large volume in the coating mixture compared to the smaller clay particles (see Figures 5b, 5c, and 6). After the coating mixture of pigment and adhesive has been applied to the paper and dried, those swollen starch granules which have been lying near the surface of the coating, collapse and leave a small pit in the coated surface. Although these pits are much smaller in diameter than the usual printed half-tone dot, if there are enough of them present on the surface of the coating, they could affect the printing qualities by giving an uneven absorption of the printing ink. These pits are too small to be seen with the naked eye, but an ordinary hand lens magnifying about ten to twenty times will make them visible. Photomicrographs of the surface of uncalendered clay coated sheets in Figures 4a to 4c show this condition at a magnification of 50 times. The coated surface in Figure 4a, and particularly the one in Figure 4c, shows the surface irregularities caused by the presence of poorly dispersed starch granules. Photomicrographs of the starch dispersions used in each of these clay coatings are shown under the corresponding picture for the coated surface to illustrate how the degree of granule disintegration correlates with the surface smoothness. The starch used in making the dispersion in Figure 4a was a highly oxidizing starch; in Figure 4b a special starch was converted to a low viscosity with 1.5 per cent of a commercial enzyme; in Figure 4c a special starch which had been treated with formaldehyde was used.

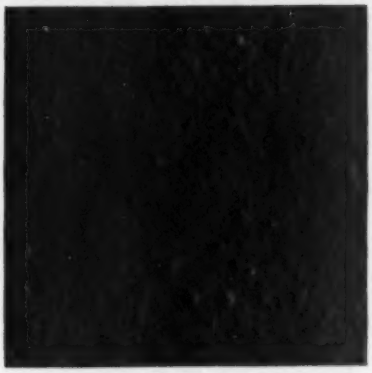
This treatment hardened the granules and made them more difficult to disperse. All starches were prepared identically by heating to 200 Fahr. at a concentration of 20 per cent solids, and holding at this temperature for 5 minutes. Approximately the same wax pick test was obtained on each coated sample, but the difference in surface smoothness caused by the difference in granule disintegration is

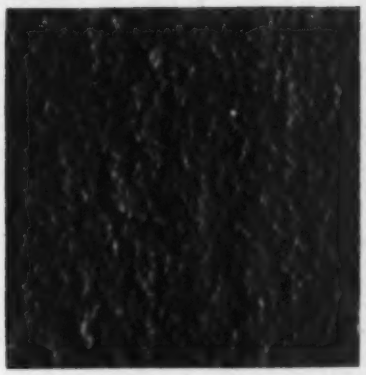


Left to right: Fig. 3a, Fig. 3b, Fig. 3c, Fig. 3d, highly oxidized corn starch of low viscosity. All 210X.

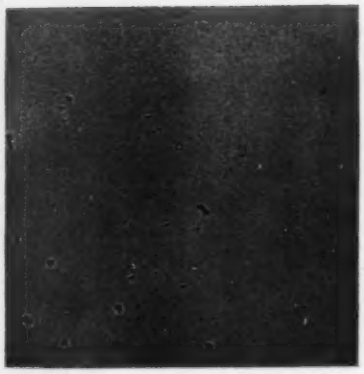
Surface of Uncalendered Clay Coated Papers







Left to right: Fig. 4a, Fig. 4b, Fig. 4c; all 50X.



Left to right: Fig. 5a, Highly oxidized low viscosity corn starch. Fig. 5b, Special corn starch converted to low viscosity with enzyme. Fig. 5c, Special modified starch that was difficult to disperse. All 210X.

All starches cooked at 20 per cent solids by heating to 200 Fahr. and holding five minutes. Used 20 per cent dry weight of starch in coated papers above.

apparent from the photomicrographs. Indications are that coating chemists could profitably investigate this field and choose the best type of coating starch and then regulate the cooking conditions to secure maximum granule disintegration. In this regard oxidized starch granules are more susceptible to granule disintegration than enzyme converted starches or most other types of modified starch and, for this reason, warrant first consideration when coating starches are investigated. Roderick and Hughes (*6*) have pointed out that the adhesive is more important than the pigment composition from the standpoint of smoothness value of coated papers and that starch adhesives usually possess higher calendered smoothness values than casein.

The pigment binding strength of some types of starch is very much dependent on the amount of granule disintegration. With such starches it is possible to secure an increase in the wax pick test by completing the granule disintegration with mechanical means such as an homogenizer or colloid mill. This offers a laboratory tool for checking on the completeness of granule disintegration, but from the practical standpoint, it is cheaper and easier to secure complete granule disintegration and maximum strength by choice of the proper starch and regulation of the cooking conditions. Aside from the consideration of strength and surface smoothness there is also a strong possibility that improperly dispersed starch results in occasional "dusting" difficulties on the calender stacks.

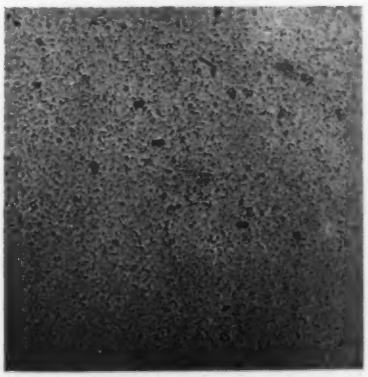


Fig. 6. Clay used in above coatings. 210X.

The viscosity and other rheological properties of a coating starch are of much practical importance. These properties are profoundly affected by certain factors in cooking such as final temperature, length of cooking, concentration, *p*H, mechanical agitation, and rate of cooling. Oxidized starches are particularly susceptible to variations in technique of cooking, both the initial dispersion of the starch and the amount of retrogradation on cooling being affected. Since most of the factors which control the flow properties of a particular type of starch depend on the cooking conditions, the coating chemist should familiarize himself with the magnitude of these effects, which are under his control. An important thing to keep in mind is that any starch dispersion containing a high percentage of swollen granules or fragments of granules will not show true viscous flow. Where the ratio of this undispersed material is high enough to bring about a structure from contact of these particles, free flow is prevented by this structural formation.

Conclusion

The fundamental chemistry of starch, like that of cellulose, is very

complex. This paper is an attempt to review some of the fundamental aspects of starch dispersions and to point out where these concepts may be of value in practical paper mill operations. Although starch is doing an acceptable job at low cost in most paper mills, further investigational work could be profitably carried out by both the paper chemist and the starch chemist with the idea of improving starch dispersions for paper mill use. The importance of thorough cooking has been stressed; and suggestions for possible further improvement in the dispersion of starch have been made.

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POSTWAR PROPOSALS

FRANCES PERKINS, Secretary of Labor

▸▸▸ BY COMPARISON, the paper industry may face fewer postwar problems than many others. For one thing, it has experienced none of the mushroom growth that has lifted both production and employment in some war industries to unheard of peaks. Indeed, the paper industry has been rather limited by constant manpower shortages, particularly the lack of men "out in the brush." In spite of this restriction, the industry has been remarkably successful in meeting wartime demands for an almost endless variety of paper products.

Though the paper industry may escape largely this particular problem of postwar demobilization, members cannot afford to neglect it. For paper manufacturers will find that their own operations are closely linked to the general level of economic activity in postwar America. And they know how complex and many-sided are the problems that peace will bring.

The tremendous expansion of our productive capacity has opened up new vistas for peacetime. The promise of higher living standards and increased well being is clear—provided we can mobilize these vast resources for the peacetime production of goods and services. To achieve this goal within the framework of our democratic institution will require careful planning and the determination to safeguard and strengthen our hard-won freedoms, our traditional belief in decency and fair play.

The program which follows does not pretend to be a complete blueprint for the postwar period. It does, however, present a number of actions which I believe should be taken as soon as peace comes. These recommendations are designed to promote the orderly return of our labor force to worthwhile civilian occupations. Moreover, these steps would seem to be a necessary part of any broader program looking toward the full use of men, materials and machines.

The first group of suggestions concerns our labor force primarily, including the millions who have gone to war. The second set of recommendations is outside the scope of the Labor Department, being mainly in the field of business development and financing. There is nothing mutually exclusive about them, however. On the contrary, we shall need to continue and enlarge the area of co-operation which has played such an important part in our war effort.

Before presenting this program, there is one subject which should be discussed. That is the expansion of our social security system along lines now generally approved. The fact that we already have unemployment insurance and old age insurance, as well as old age public assistance and public assistance for dependent children, will prove an anchor to windward during the transition period. We should make this protection the basis of a broader and more complete social security.

The enlarged system should cover all workers, including farm and domestic workers. It should be made available to self-employed persons who wish to buy into it, such as business and professional people, operators of farms, and others who "work for themselves." This expansion is quite feasible and is planned in detail to enhance individual security within our free industrial system of private enterprise and capital investment.

It is obvious that this step will be much more effective if it precedes the War's ending. And needless to say, discharged war veterans should be automatically eligible for various benefits.

Whether we give ourselves this added protection now or later, I believe that the following steps should be taken as soon as the War is over:

Revoke all permits which have been issued for the employment of minors beyond 8 hours a day, or for their employment in ordinarily prohibited occupations.

Nearly four times as many children 14 through 17 years of age were certified for full or part-time employment under state laws in 1942 as in 1940, and figures for the first six months of 1943 more than doubled the same period in 1942. Nearly three million youngsters in this age group are now at work. With this great influx of children into industry have come many old child-labor problems and in some spots there has been a lowering of protective measures. It would be tragic indeed to let these lower standards carry over into the postwar period.

Revoke all permits for the work of women beyond 8 hours a day or on the graveyard shifts.

While we do not have complete figures, the number of women workers affected by such permits is very large. Some relaxation of peacetime standards was more or less inevitable under present war conditions, but we must reverse this trend when peace comes.

Promote the reduction of hours of labor under the Fair Labor Standards Act to 40 hours a week to help spread the work.

Of necessity, most schedules are now well above 40 hours. In October, 1943, the average of hours actually worked in all manufacturing industries

was 45.4, which means that the scheduled workweek was about 48 hours. In durable goods, workers averaged 47.3 hours weekly, indicating a schedule of close to 50 hours. Some industries exceeded these figures and many individual workers put in far longer hours.

Revoke Executive Order 9240 (which governs the overtime and premium pay practices on "all work relating to the War"), and abolish Sunday work, holiday work and overtime work so far as possible.

Unfreeze labor under the War Manpower Commission's right to issue directives and reestablish the freedom and mobility of American Labor.

Make the U. S. Employment Service a strong and effective instrument for moving workers out of war industries and into civilian industries.

In a very real sense this problem overshadows all others. It is national in scope and will require Government action at every level—Federal, state and local. The magnitude of the task is indicated by the fact that about 25 million job shifts, transfers, and placements may be necessary before war workers and those now in the Armed Services are established in regular, peacetime occupations. Moreover, this transition should be carried out with the minimum of delay.

Set up a fund which can be loaned through the U. S. Employment Service to help workers who have no money to get back home or to reach a place where they might find employment.

This assurance will be a positive aid in keeping workers on the job before peace comes. Already there are signs of uneasiness among many who have traveled long distances to take war jobs. In eleven states the estimated military and industrial demobilization is 35 per cent or more of total employment in 1940. Especially in smaller communities which recruited numbers of war workers from a distance, shutdowns and cutbacks may raise acute problems.

Encourage the immediate retirement of those above 65 on their old age pensions.

Encourage persons under 20 to resume their education in school, college or vocational institutes.

High school enrollment has dropped 15 per cent for the country as a whole during the last three years. And there are a great many in the Armed Forces who will want to go on with their education or undertake special training along new lines.

Advise and assist women who came into the labor market because of the war need to withdraw and make opportunity for girls and women who must work regularly.

There may be several million women in this category, but we must not confuse this group of workers with the growing army of women who are breadwinners of necessity. Back in June, 1940, we had nearly 14 million women in our normal labor force. We must guard, too, against any renewal of wage discriminations and other unfair practices that handicap women workers—this is a long fight which has yet to be fully won.

Each of the steps I have outlined so far deals mainly with our working force. Together these actions will help millions of men and women bridge the gap between war and peace. Added security for these millions means increased stability throughout our whole business and industrial structure.

In the same way, sound measures that promote business expansion will have favorable repercussions on the labor market. The following suggestions have that dual objective.

Provide for proper Government assistance for loans to business which can reconvert quickly and manufacture or distribute civilian goods for which there is a market and which will provide large employment.

Encourage and revive the luxury, transportation, and amusement industries and trades which are healthy and good for the public judged by normal standards.

Develop Government aid for settling certain qualified groups on the land with a scientific program of assistance in crop planning and marketing and supervision.

Open up the planned public works in those localities where there appears to be a considerable pool of permanent residents for whom no private employment is immediately available.

A variety of public works programs have been developed on a local and regional basis. Much of the program is already engineered and audited and can be put into operation quickly. In some localities it may be necessary for the Government to develop a public works program geared to meet community needs.

Renew all techniques of stabilized employment which were partly developed during the last depression, such as orders in advance; extension of rural electrification, manufacturing, Government, and other capital industry orders on a regular basis.

At the same time we shall need an intelligent carefully worked out program for disposing of surplus materials, including war plants, held by Government agencies. We must neither let these materials go to waste nor release them in such a way as to dislocate the normal channels of retail and wholesale distribution.

Release the housing programs now found to be necessary and give approximate Government assistance to provide both construction of homes and housing improvements.

Private housing construction must continue to play the major role, but Government should supplement such developments wherever private investment is lacking. Such aid will enable us to meet the long-standing need for good homes and at the same time provide an important stimulant for business and industry.

A properly planned housing program is one of the best balance wheels for our complex economy and this very fact makes it essential to approach the subject without bias. Past experience has shown that there is ample room for both publicly and privately financed housing. Moreover, this approach is well adapted to the needs of individual communities.

Encourage normal purchasing by the public through carefully planned and systematic use of war savings rather than speedy reckless spending.

Encourage the purchasing of permanent consumers' goods, like refrigerators, vacuum cleaners, furniture, kitchen utensils, automobiles, textiles, etc.

Business and industry can do a great deal to guide buying habits and at the same time help to assure themselves an orderly predictable consumer demand.

A sound program of this sort will encourage thrift and savings. Thanks to higher earnings and the shortage of goods most American workers have savings today—some are in war bonds, some in banks, and even more are in the stocking. It may be that the Nation's banking facilities for savings are not wholly adequate to serve our working people. Savings banks are not developed throughout the country and such savings departments and savings banks as there are have the usual limited hours which are not always convenient for working people on payday. In addition, there are wide areas in which the distance to a bank makes regular deposits very difficult.

Encourage cultural and recreational activities as a means of employment as well as a method of achieving a sound society and balanced economy.

This program gives the Federal Government a significant role in regulating and adjusting some phases of our complex industrial life. But these adjustments do not imply regimentation—quite the contrary. Their purpose is to strengthen our democratic procedures and foster increased co-operation between management, labor and Government. We shall need this greater unity during the transition from all-out war to a fruitful and lasting peace.

Review of Some Litigation Involving Paper and Pulp Producers

LEO T. PARKER, Attorney at Law

▸▸▸ DURING THE YEAR 1943, numerous manufacturers of paper and pulp throughout this country have been subjected to expensive suits. A review of these litigations discloses that an impressive majority of these suits may have been avoided had certain officials been familiar with the modern law.

Testimony of Chemists Wins a Suit

In many instances employers may avoid liability for alleged sickness of employees engaged in paper and pulp production by having expert witnesses testify.

For example, in Clark v. Southern Kraft Corporation, 11 So. (2d) 17, reported February, 1943, an employee filed suit and alleged that while in the employ of the Southern Kraft Corporation, for six years he worked in close proximity to the beaters that contained acids, liquids, and other chemicals necessary in the production of paper; that such beaters were in a bad state of repair and leaked, and that he was compelled to walk and stand on the floor where the chemical mixture accumulated and to handle objects saturated with the solution; that because of his more or less constant contact with the chemicals the palms of his hands and soles of his feet became calloused, cracked open, and were sore and tender, which condition prevented his performing labor of any kind.

He further charged that his employer knew, or should have known, of the leaky condition of the beaters and that the floors were continuously wet with the chemical solution, and was negligent in failing to remedy the situation and provide for him a safe place to work.

The employee asked the court to grant him heavy damages.

During the trial, several chemists testified that the stock in the beater was considered a harmless neutral liquid, meaning that it was neither an acid nor an alkali. Therefore, the higher court refused to allow the employee damages, and said:

A preponderance of the evidence does not support and favor the demands of plaintiff (employee), and, accordingly, the judgment will be and is affirmed."

Validity of Arbitration Agreement

Although ordinary arbitration agreements are valid and effective, all provisions therein are void which designates a court to select an arbitrator.

For example, in Fox River Paper Company v. International Brotherhood of Papermakers, Local Union No. 16, 7 N. W. (2d) 413, reported March, 1943, it was shown that the Fox River Paper Company entered into an arbitration agreement with a Papermakers Union. It was agreed that the arbitration board should be composed of three members, one to be chosen by each of the parties to the agreement, the third member to be chosen by the two so appointed. It was further agreed that in the event the two members of the Arbitration Board were unable to agree as to the selection of a third member of the Board within eight days, this third member would be selected by "the Circuit Court of Outagamie County."

When the two selected members of the Arbitration Board failed to select the third member, the Circuit Court was requested to designate him. However, the higher court held that the court had no jurisdiction to make the selecting, saying:

"No principle of law is better established than that parties by agreement cannot confer jurisdiction upon a court."

Generally speaking, arbitration clauses in a contract are valid and enforceable because such agreements reduce the multiplicity of suits before courts.

However, the fact that contracting parties agree to arbitrate by no means forestalls legal suits, nor does an arbitration agreement always eliminate expenses associated with suits, as testimony costs, lawyer fees, etc. Furthermore, establishment of a "ceiling" price lower than the price specified in a contract of sale automatically cancels the contract.

For example, in the leading case of Kramer & Uchitelle, 43 N. E. (2d) 493, it was shown that a purchaser entered into a contract with a manufacturer to purchase specified merchandise at a stipulated price. Also, the contract contained a clause wherein both the buyer and seller agreed to settle all disputes by arbitration. Later a "ceiling" price was established on the merchandise lower than the contract price. The seller refused to make deliveries at the ceiling price.

The buyer contended that the controversy should be settled by arbitration. However, it is interesting to observe that the higher court refused to permit arbitration and, also, held the sale contract void and non-effective. This court said:

"By act of Government there was complete frustration of performance excusing the seller from performance. . . . The arbitration clause was only an incidental part of an indivisible contract of purchase and sale and when the contract was at an end the arbitration provision no longer existed."

Legal Rights of Buyer

Modern higher courts hold that when a seller breaches a warranty the buyer has several remedies. First, he may completely rescind the contract and refuse to receive the merchandise; or if the goods already have been received he may return them and recover the price previously paid plus damages. On the other hand, if the goods were delivered to the buyer, he *cannot* later rescind the sale if he knew of the breach of warranty when he accepted the goods. Moreover, if a purchaser fails to notify the seller within a reasonable time of his election to rescind the contract, or if he fails to return or does not offer to return the merchandise to the seller, the latter can sue and recover the full purchase price.

If a buyer is legally entitled to rescind a contract of sale and elects to do so, he can return the merchandise and recover the price, or any part thereof already paid, plus damages.

For example, in Redwood Fibre Products Company, Inc., v. Miller Manufacturing Company, 143 Pac. (2d) 389, suit was filed by a seller against a purchaser to recover $8,782.80, claimed to be due the purchaser on account of the alleged breach of a contract of warranty involving the manufacture and sale of two mills or machines designed to grind and shred redwood bark. Under the terms of the contract, the selling company expressly agreed that in the event the mills

would not perform the work satisfactorily that it would repay to the purchaser the cost of the mills.

Although the seller "assured and warranted" that it could and would build and manufacture two mills which in all respects would be proper and suitable for the purposes, and the purchaser proved that the mills would not produce the stated quantity of materials, the lower court refused to hold the seller liable in damages. However, the higher court reversed the verdict, and held:

"When a sum of money has been paid pursuant to a sale contract and the consideration for the sale has entirely failed, the law will imply a promise on part of seller to repay the money to the buyer and an attachment will lie against seller's property in favor of the buyer."

Driver Fails to Set Flares

Modern higher courts consistently hold that the owner of an automobile is charged with knowledge that it is a dangerous instrumentality when in operation on the highway whether moving or standing. The driver must set flares to warn other drivers of the location of a disabled truck at night time, or heavy damage allowances may be awarded.

For instance, in Jacksonville Paper Company v. Carlile, 15 So. (2d) 443, reported January, 1944, the court records show that employees of the Jacksonville Paper Company loaded one of its trucks and started to make a delivery. The next time the loaded truck was heard of, it was parked on the highway. It was late at night and the truck had no flares or signals to warn the public. When thus parked, the driver of another automobile ran into the truck and was seriously injured. He brought suit for personal injuries and recovered a judgment against the paper company for $30,000 in the lower court. The company appealed to the higher court, which upheld the verdit, but reduced the amount to $20,000.

License Law Void

Modern higher courts consistently hold that unreasonable municipal license ordinances which require payment of fees to park trucks on streets while unloading merchandise are void.

For example, in Atlantic Paper Company v. City of Pembroke, 24 S. E. (2d) 882, reported April, 1943, a city passed an ordinance requiring all firms "delivering by motor truck any goods, wares, hardware, implements, or merchandise to any store, warehouse, depot, or dwelling within said city," to pay an annual license fee of $10. In holding the ordinance void, the higher court said that while parking fee ordinances are valid, an ordinance is void which is designed to place a charge upon every one who delivers, either by motor truck or otherwise, any article within said city.

Pulp Waste Kills Fish

Modern higher courts hold that the law will not permit a substantial injury to a person or property *by a nuisance* to go without individual redress, whether the right of action be referred to the existence of a special damage, or to an invasion of a more particular and more important personal right. The personal right involved here is the security of an established business. Therefore, where the testimony proves that pollution of a stream by a manufacturing company effects damage to lower riparian owners, the company may be liable for resultant damages.

For example, in Hampton v. North Carolina Pulp Company, 27 S. E. (2d) 538, reported January, 1944, it was shown that a man named Hampton owned certain lands upon a river bank where he had established a fishery. He filed suit against the North Carolina Pulp Company and testified that the latter operated a plant for the manufacture of bleached and unbleached sulphate pulp, and turned into the waters of the river opposite its plant "a great volume of poisonous, deleterious, and objectionable waste and substances, inimical to the fish inhabitating the waters, to such an extent, and in such volume and quantity, as to interfere with the free and long established passage, migration, and habit of said fish from the ocean on their way to the spawning grounds in the upper reaches of the Roanoke River, thus to a large extent destroying the fish, and diverting said migratory pilgrimage, so as to seriously damage the business of the plaintiff (Hampton) and the profit from the use of his premises."

Hampton introduced other testimony to the effect that prior to the erection of the plant a contract was made between the North Carolina Pulp Company and the State Highway Commission, under which the commission agreed to build a certain road very valuable to the operations of the plant and that the pulp company would refrain from discharging deleterious or injurious substances from its proposed plant into the river. Hampton alleged that the pulp company violated this contract and that the discharge of poisonous and deleterious substances from the plant constitute a wrongful and unlawful trespass and nuisance, destroying the fish inhabiting the waters and greatly damaging the usufruct of his property and his fishing business. He asked the court to grant him immediate relief and heavy damages. In view of these facts the higher court indicated liability on the part of the pulp company and said:

"The right to have a natural water course continue its physical existence upon one's property is as much property as is the right to have the hills and forests remain in place, and while there is no property right in any particular particle of water or in all of them put together, a riprarian proprietor has the right of their flow past his lands for ordinary domestic, manufacturing, and other lawful purposes, without injurious or prejudicial interference by an upper proprietor."

Loss of Finger Is Total Disability

It is well known that payments specified by Workmen's Compensation Laws for "total disability" greatly exceed the usual payments for loss of a finger. However, modern higher courts hold that loss of a member, as a finger, may result in total disability of workmen who perform special kinds of services. In other words, the courts hold that it makes no difference as to the degree of injury if the injury is sufficient to disable one from performing the work he is accustomed to do or work of a reasonable character which he is qualified to perform.

For example, in Jones v. International Paper Company, 11 So. (2d) 555, it was shown that the index finger of a man named Jones was seriously injured while performing his duties as a brick and stone mason under a contract of employment with the International Paper Company, which operates a paper manufacturing plant. He sued for workmen's compensation at the rate of $20 per week for four hundred weeks, less $446.16 paid him, on the theory that from the accident he has been rendered totally and permanently disabled to do work of any reasonable character. It was contended that Jones was entitled to recover only the amount specified in the State Workmen's Compensation Law for the loss of a finger. However, the higher court allowed compensation based upon total disability, and said:

"It is equally as well settled that the provisions of the Act establishing a schedule of compensation payments for the loss or loss of use of specific members of the body have *no* application in cases where total disability results from the loss or serious impairment of a member of a workman who does manual labor for a livelihood."

Injury Suit Compromised

It is well established law that a bona fide contract under which an injured

employee agrees to accept a stipulated sum in settlement of a damage suit may be valid. However, a contract is void in which an injured employee agrees to accept a certain sum to settle a claim under the Workmen's Compensation Laws, if such contract was signed before the employee became aware of the extent of his injuries.

For illustration, in Stewart v. Brown Paper Mill Company, Inc., 11 So. (2d) 627, reported January, 1943, it was shown that a man had worked for The Brown Paper Mill Company, Inc., for a number of years. The testimony clearly showed that he was injured while working inside of a railroad box car unloading pulpwood from the car at the plant of the paper mill. The injured employee did not immediately report his injury to the employer. Later, however, he signed an agreement to accept a small sum of money as full payment for the injury. A few days after signing this compromise agreement he discovered that his back was seriously injured. He sued for rescission of the signed agreement and additional compensation. The lower court held in favor of the employee and the higher court approved the verdict, saying:

"There is no doubt in our minds, that plaintiff (employee) suffered a severe injury to his back while in the course and scope of his employment and that . . . he was totally disabled from performing any work of a reasonable character. This being true, the only question remaining for determination is whether or not he is bound by the compromise judgment."

Employer Installs Blower System

Modern higher courts hold that an employer who uses ordinary care to remove dust and the like from his plant is not liable in damages to employees who contract silicosis, bronchiectasis, or like diseases.

For illustration, in Basye v. Odom, 168 S. W. (2d) 1092, it was shown that an employee worked in a plant about seven months in the year 1937, about the same time in 1938, nearly all of 1939 and three months in 1940. He quit work because of illness which later was diagnosed as bronchiectasis, which is a disease causing dilation of one or more of the large bronchial tubes.

He brought suit against his employer to recover damages for his illness and disability. He alleged that the room in which he was required to work was filled with a fine, powdery dust, that completely filled the air, the breathing of which caused him to develop tuberculosis, sinus trouble, and bronchiectasis, and that he did not know this dust would be injurious to his health.

The employee further alleged that his employer failed to exercise ordinary care in providing him with a reasonably safe place in which to work.

However, during the trial the employer proved that in 1937 he had installed a modern, up-to-date blower system to pick up or catch the dust and blow it away and that this system took care of about 95 per cent of the dust. Therefore, in view of this testimony the higher court refused to hold the employer liable in damages.

In another case (Hudson Company, 32 Atl. (2d) 733), the higher court refused to allow an employee damages for the contracting silicosis. The employer proved that the employee knew when he accepted the job that his work "was in dust." Therefore, the higher court refused to award the employee damages.

Purchaser Liable on Contract

When a seller makes an offer which is accepted, by the purchaser, a valid contract is completed and both parties are obligated to perform fully their assumed responsibilities. If, however, both parties agree to new contract terms, the first contract is automatically cancelled. Or, if the purchaser fails to accept the seller's offer *unconditionally* no contract is made. Or, if during correspondence the seller refuses to make delivery and the buyer gives another order, he forfeits his right to sue and recover damages from the seller for breach of the original contract.

For example, in Pittinger v. Southwestern Paper and Pulp Company of Fort Worth, 151 S. W. (2d) 922, it was shown that a seller accepted a buyer's offer and later refused to deliver the goods at that price, but quoted higher prices. The buyer accepted the new contract, used the merchandise and then refused to pay the seller a price higher than his first quotations. This court held the buyer bound to pay the seller the prices in the last contract and refused to hold the seller liable for breaching the first contract.

Check Chart for Chain Belts

Symptoms	Possible Causes	Remedies
Excessive Noise	Misalignment	Check alignment and correct
	Too little or too much slack	Adjust centers for proper chain slack
	None or improper lubrication	Lubricate
	Loose casing or bearings	Draw up all bolts and brace casings if necessary
	Chain or sprockets worn	Reverse* or renew if necessary
Wear on chain side-bars and sides of teeth	Misalignment	Remove chain and correct alignment
Chain climbs sprockets	Poorly fitting sprockets	Turn chain* and sprockets over and replace if necessary
	Severe overloads	Reduce load if possible—lubricate driven machine
Broken pins and rollers	Chain speed too high for the pitch	Use chain of shorter pitch of equivalent or greater strength
	Shock or suddenly applied loads	Avoid—easy starts give long life
Chain clings to sprockets	Incorrect or worn sprockets	Turn sprockets and chain* over and replace if necessary
	Heavy and tacky lubricants	Clean chain and sprockets and lubricate correctly
Chain whip	Long centers or high pulsating loads	Reduce centers when possible
Chain gets stiff	Misalignment	Check alignment and correct
	Improper lubrication	Remove chain, clean and relubricate
	Excessive overloads	Reduce load when possible
Broken sprocket teeth	Obstruction—or foreign material in chain case	Check chain clearances Drain and clean chain case
Cotters come out	Vibration and centrifugal force	Turn chains over so heads of cotters are on inside nearest shafts

*Applies to cast or steel chain without rollers only.

—*Bulletin No. 435*, The Chain Belt Company.

Automatic Control in Sulphate Pulping Operations

C. W. WILKINS, Process Engineer
National Container Corporation

▸▸▸ IN EVERY SULPHATE MILL, the problem of automatic control begins in the wood yard. Some of the factors which must be considered in the handling of pulpwood follow:

a) Method or manner of receiving incoming shipments

b) Arrangement of wood storage as affected by (1) Shape of yard, (2) Size of yard

c) Length of time of storage as affected by (1) Supply of pulpwood, (2) Capacity of transporting equipment

d) Conveying system as affected by distance to barking drum or drums

The ideal arrangement would be to have automatic pulpwood unloading by barge, truck or railroad with the minimum conveying distance. This arrangement would entail special design of trucks, railroad cars and barges, and special stacking equipment. The familiar sight of the dump truck and the knowledge that whole railroad cars can be emptied in one step should suggest valuable ideas to kraft mill engineers. Other industries construct storage and loading bins utilizing elevated rail or high embankment (with suitable protection) for either truck or railroad car dumping. Could not this idea be applied to the wood yard of a pulp mill?

It should not be a novelty for a storage bin to be located directly above or beside a conveying means and feeding automatically into it. This bin could receive incoming shipments of pulpwood by dumping; and it could be so designed as to direct the movements of dumped logs into positions for automatic or manual feeding.

Automatic unloading from barges presents still another angle for the designer. The capacities dealt with in barge unloading should increase the over-all economies of this method.

Wood Conveying

From wood yard storage to the barking system is a problem of conveying and handling. The solution, in general, is to have feeder conveyors supply a main conveyor system.

These feeder conveyors are of two types, stationary and movable. Small yards find the movable feeder conveyor most convenient and economical to operate. This conveyor operates on a three-rail system and is moved by an electric drive from the same motor operating the conveying chain. Automatic control is effected by an overload cut-out. In case no drive is available, motivation can be supplied by truck or other power means. It is possible that rubber tired wheels will be substituted in the future for rails and flanged steel wheels. This design change would certainly give the conveyor more flexibility.

Large wood yards invariably use the stationary feeder system, reserving the movable types for only certain specialized operations. To prevent overloading is the only control of stationary conveyors that is necessary. This control is accomplished in the electric motor.

The main conveyor system leading directly to the barking drum installation may consist of parallel chains pulled by one or more electric motors. The usual method for the smaller mills is to have two or more conveyor chains arranged in series and operated by electric motors. All motors are protected from overload.

Some mills prefer to have a separate system for handling reject logs or "catfaces." The most feasible way for handling these logs is to have a reject feeder conveyor placed somewhere along the main conveyor at a suitable point and leading off from it to a hog, waste storage or to any other acceptable method of disposal. This arrangement greatly simplifies the handling of reject logs, provided an inspection and removal point are installed. The removal point can be automatic; but the inspection requires human intelligence.

Bark Removal System

All sulphate mills in the South use one or more barking drums. The automatic control of the flow of logs through such drums is fraught with many possibilities as well as pitfalls.

Operating capacity of the drums is a function of log output to log input. Since production is the number one item in any economical system, it would seem more logical to run the logs through the drums at near capacity. Then, if all of the bark is not removed, another drum should be installed in series and the entire installation controlled by ampere output indicators. Any automatic controls should be set to operate only when peak capacity is passed.

Whenever changes occur too far on either side of the best operating capacity, a warning light or bell might ring to warn the operator. This warning, of course, is in addition to the usual overload cut-out control.

If the drums and conveyor chains were all interconnected to the same electric overload relay, it might be possible in a two-drum system to automatically slow down one drum and the main conveyor chain by increasing the load on the second drum or vice versa. This control presupposes a certain uniformity of logs which is most difficult without a system of sizing. Unusual sizes that get by will have to be spotted by the operators or by an electric eye system.

The loose bark is conveniently conveyed to a place of disposal which in most instances is a bark burning furnace. The fineness of the bark and the completeness of its removal from the logs is affected by the interior design of the drum or drums. When the size of the logs is not carefully watched, it is possible for small "logs" (better called sticks) to be forced through the drum interstices normally reserved for the passage of bark. When this situation occurs, trouble inevitably results. Shortening the length of the slots in the drums and previous inspection of the logs should prevent trouble from this source.

It would seem that the more uniformly the logs can be fed to the drums, the more efficient the drums would become. If this assumption is true, then electronic sizing and separation of the logs would produce the desired uniformity with resulting increase in efficiency. However, to effect this condition, one or more extra drums would be required to handle the various sizes. In part, this additional expense would be offset by a reduction in size of drums and power requirements.

Wood Room Control

Just as fiber length is a basic determining factor of paper quality, chip size is one of the basic criteria of chemical pulping. The idea that any heterogeneous conglomeration of hogged, chipped, shredded, or comminuted wood can be cooked satisfactorily has been refuted. Thus, any equipment, automatic or otherwise, capable of increasing the uniformity of chip size, should be welcomed and given serious consideration by the chemical pulp industry.

Automatic size classification of logs, so easily accomplished by the "electric eye" points toward a solution of this problem. The adoption of a system of log classification, however, would require extra chippers. In lieu of extra chippers, separate storage would have to be provided for above and below average size logs. The invention of a chipper for handling size-classified logs simultaneously on two or more cutting tracks and with automatic pitch control is not an impossibility.

The steel industry, for example, has produced a revolving multiple cutting face with structurally sound and acceptable working characteristics. The airplane industry also has applied automatic pitch control to a mechanism far more difficult and delicate to integrate than a chipper.

Automatic size classification of logs with necessary chipping installations should result in the following advantages:

a) Increase in chip uniformity

b) Increase in chipper capacity with over-all increase in efficiency

c) Decrease in slivers with consequent reduction of rechipping

d) Ease of producing chips in selected range of sizes

The last two advantages are particularly susceptible to pitch control

In spite of ample diameter, the modern chipper presents only a small section of its face as a cutting tool. Likewise, its operation is marred by numerous shutdowns. Not infrequently, shutdowns are caused by metallic objects embedded in the wood coming in contact with the cutting knives and either nicking them or actually destroying them. Such objects could be located by an electromagnetic mechanism and then an automatic control could reject the wood containing them.

Chip Screens

The sizing of the chips is accomplished by screens based on three fundamental motions, namely, vibratory, shaking and gyratory.

All of the screens seen by the author have been set to run at only one speed. The selected speed for the individual unit may or may not be its optimum. A rheostat control unit might be used to determine the optimum speed. In addition, the angle of elevation of a screen, number of vibrations or shakes per minute, and size of the screen openings all exert a strong influence on the efficiency of the screening operation.

Formerly it was thought that the larger size chips would produce the better fiber, so that acceptable chips always leaned toward the larger sizes. Now the tendency is toward smaller and more uniform chips, and any controls which tend to hold the size of chips within small tolerances should be welcomed.

There are some interesting possibilities of automatic control of chip size. The flow weight of the various sized chips could be correlated and integrated with the speed and pitch of the chipper as well as with the amount of chips going to the rechipper. Indicators, continuous recorders, and auditory devices would enable the operator to maintain complete control of the wood room.

Chip Conveying

Of the several methods of chip conveying, the belt is by far the most universal. In most cases, it probably is the most convenient. Other less used methods are the pneumatic, screw, gravity chute, bucket, etc. On the belt type, no controls other than the usual overload relay cutout for the motors are used. This practice is unfortunate because there are interesting possibilities in the use of belt wear detectors. Recordings of such devices could predict serious breakdowns and thus make shutdowns for inspections unnecessary. Another reason for developing devices for showing belt wear is that the use of belts is constantly expanding. For hauling distances over three hundred feet, the belt conveyor has no rival in continuous materials handling.

Chip Storage and Digester Operation

A means of chip storage, prior to cooking, is necessary in order that any breakdowns occurring in the wood yard or woodroom will not interrupt the cooking processes. In nearly all cases, chips are stored in bins located directly above the digesters. In a way, this practice is unfortunate because it makes it difficult if not impossible to install automatic control devices in the cramped space between the bins and the digesters.

A much better practice, which is employed in some of the most modern mills, is to have chip storage on ground level and to use belts to feed the chips to the digesters. This method definitely facilitates the use of weight-meters, flowmeters (volume determinators) and such moisture determining devices as may be available.

Standard automatic weighing equipment is available for such applications. Moisture determination by automatic means, however, is still in the experimental stage. Nevertheless, it would appear that some modification of an instrument now used to determine and record the moisture content of pulp sheets could be made applicable to chips. This instrument operates on the principle that water vapor arising from pulp decreases the conductivity of a resistance plate carrying an electric current. If the instrument is applied to chips, the area of the resistor would have to be larger than the one used for pulp. Likewise, two instruments installed in parallel probably would serve more efficiently than one.

Some of the earlier sulphate mills employed tumbling digesters for pulping. Most of them because of leaks at the trunnions have been replaced by stationary digesters.

In direct cooking, a number of uncontrollable variables appear within the digester. These variable serve to militate against the value of automatic controls because their value can be completely effective only as long as controlled or corrected. Some of these uncontrollable variables are: fluctuating steam pressure, fluctuating steam temperature, fluctuating steam quality or superheat, and uncertainties of uniform circulation.

Although automatic control can be placed on entering steam from any one of several points, the unpredictable influence of some or all of the uncontrollable variables could nullify the value of such control.

Some measure of control is exercised or attempted on the following variables: average temperature of digester, rate of circulation, amount of dilution caused by condensation of steam (only approximately), vapor carry-over and pressure in gassing off, and alkalinity and sulphidity of the liquor.

To correlate these variables with automatic controls as a related function is a real task. The approach to the problem is strictly empirical.

The usual controls in the digester room are: steam flow, steam pressure, steam temperature (both recording and indicating), digester temperature (from one or more points), temperature of circulating liquor, various line pressure gages, and the usual overload relay cut-outs for motors. Only the steam flow is automatically regulated and that is not done in all of the mills. The other controls serve the operator only in a visual capacity. An automatic device to correlate the rate and temperature of gassing off with the rate and temperature of the incoming steam so as to maintain constant liquor volume might prove feasible with direct cooking.

With indirect cooking or a combination of direct and indirect cooking, it would be possible to eliminate all of the variables affecting direct cooking.

The control installations and correlations would be as follows:

a) Automatic steam flow and pressure regulator on heater correlated to optimum cooking temperature of liquor and to pressure cycles of digester

b) Variable liquor flow control interconnected to optimum temperature and pressure in digester

c) Automatic liquor strength compensator controlled by optimum condition time cycle

d) Automatic gas off regulator with alkalinity carry-over protective device

e) Automatic warning devices, such as bells or lights, when a blow is ready, and especially around locations where there may be danger to workers

f) Automatic loading, weighing, volume determination and moisture determination which together will automatically establish liquor strength and volume of liquor in digester and set temperature, pressure and time of cooking cycle

g) Automatic blowing of digesters at end of time cycle, with protection against blowing before space is available in diffusers or wash pans

Only capping and uncapping of the digesters would be manual operation. Even these operations could be improved upon from a time and effort standpoint.

An automatic pulp sampling device set to operate when a digester blows would be welcome *if trouble-free.*

In recapitulating, a number of the devices which have been suggested, have been tried in different mills. One particular mill has tried to operate an almost completely automatic digester. This attempt as well as others have failed because of:

1) Frequent scaling and leaking of heater tubes

2) Too rapid corrosion or deterioration of automatic instruments, thus causing reduction or failure of sensitivity

3) Too complicated instrumentation for usual operator to handle

4) Improper allowances for variations in strength of cooking liquors traceable to fluctuations in causticizing operations

5) Lack of quick method for determining variations in resin and lignin content or other non-cellulosic materials

Some system still may be devised whereby the cooking operation will be greatly improved not only from quantity and quality standpoint, but also from the standpoint of the operators.

A system of continuous cooking with streamlined flow of chips, chemicals and steam surely would present a much simpler and easier problem for automatic control.

Washing Operations

Pulp washing methods fall naturally into three classes, depending on type of equipment employed, namely, diffusers, cylinder washers, and screw presses.

In each case, the black liquor in the pulp is replaced by water. The replacement is made with progressively weaker solutions of black liquor. This procedure is followed in order to obtain as highly concentrated black liquor as possible.

When using diffusers, a certain degree of automatic control may be obtained on the various wash liquors. A device might be used for obtaining the strength of a wash liquor. Such a device, operating between certain fixed limits of alkalinity could regulate the timing of the wash cycle. For example, if a wash is started with 6 degree Bé liquor, the original 12-degree Baumé liquor will be reduced to a certain strength by it. An alkalinity indicator device could be set to register for this particular dilution. When this dilution is reached, an electric changeover system could shut off the supply of 6 degree Bé liquor and turn on the supply of 1½ degree Baumé liquor. When the liquor strength drops to another certain predetermined point on the alkalinity indicator, an integrated electric timer could set into operation a series of timed washing cycles, using mill hot water.

In continuous vacuum washing, stock from the blow tank or blow pit is diluted with evaporator feed liquor so that it can be easily pumped to the washing system. The washing operation involves the following steps:

a) Diluted stock from blow-tank goes to cylinder pick-up trough

b) Cylinder picks up continuous sheet of pulp which receives additional wash liquor (or wash water) while on the wire

c) Wet stock is removed on opposite side of revolving cylinder by a doctor and allowed to drop into a trough of pulp slush

d) Pulp slush, which is agitated continuously, flows by gravity to next washer where the washing operations are repeated in essentially the same manner as on first washer

The number of washers and the number of different strength wash liquors used in pulp washing will depend upon the degree of washing desired, the volume of the pulp washed, and the disposition to be made of the various wash liquors.

For automatic functioning of continuous vacuum pulp washing, the following operations would have to be controlled:

1) Flow rate of pulp to first stage washer

2) Amount of black liquor added to blow tank for dilution

3) Flow rate and temperature of several wash liquors

4) By-passing of stock to storage chest

5) By-passing of stock around any washer to prevent interruption of operation in emergencies

6) Flow rate and temperature of wash water

7) Degree of vacuum

These various operations can be instrumented by mechanisms. Some of these mechanisms for such control are already available. Other mechanisms would have to be developed. Control might be as follows:

1) Flow meter attached to evaporator feed liquor line—actuating an automatic valve for dilution liquor control

2) Flow meters and temperature indicator and recorders correlated to automatic valves by usual electric actuating devices

3) Actuating devices to by-pass valves connected to all safety or protective controls for overflow, washer stoppage, vacuum breakdown, etc.

4) Conductivity controls for wash waters

5) Rheostat, controlling vacuum pump speed, correlated to vacuum indicators in cylinders

Screen Room

Control of the pulp screening operation is maintained through a header, which may be of open sluice, closed pipe, or a combination design. Customarily, the flow rate to each knotter is controlled by manually operated valves. In a closed system, control could be automatic with provision for by-passing whenever clogging occurs. To prevent clogging, high pressure showers could be started automatically and continued in operation for a predetermined time interval. This interval would be adequate for the removal of the obstructing material. In case of obstruction in the header, an automatic valve could return the unscreened pulp to the chest without stopping the pump.

Flat screens offer less operational difficulties than rotary screens but they are harder to control automatically. Rotary screens are more readily adaptable to automatic control because of their closed character. A troublesome tendency of rotary screens, as with knotters, toward clotting makes it necessary at times to increase the dilution water at certain key points. To suggest automatic means for taking care of this dilution that would not prove

prohibitive in cost is indeed difficult.

Rejects from knotters and centrifugal pulp screens commonly are passed to flat screens where good fiber may be recovered. The rejects from these screens are then pumped, or otherwise conveyed, to whatever means may be employed for their disposal.

Whether pulp thickeners are of the open-end cylinder or rotary vacuum filter type, the main controls needed for them are liquid level and consistency regulation. Automatic devices suitable for such control have been used for years.

In flow measurement, use is made of such basic devices as the orifice, the flow nozzle, the venturi, the weir, the capillary, and the area float. All of these devices, except the area float, use the head flow principle as a factor in design, while the area float uses the cross-sectional area or area of flow passage principle as its basic design factor.

Pressure is measured directly. It is transmitted by means of a Bourdon tube and multiplying levers to a dial or automatic control device.

Temperature is measured by utilizing the different expansion rates of metals, liquids or vapors; by change in conductivities; by effect on electric resistors and by photometric devices.

Liquid level controls utilize moving floats, electric eyes and changes in conductivities of electric probes on contact with liquids.

Other special devices utilize displacements (hydrometer principle) for densities (sp. gr.) conductivities (useful for wash waters), electron tubes and viscosity measuring equipment.

Regardless of the manner of measurement, the correlations within control systems will require the transformation of the energy derived in the measuring system into electrical energy. This energy, in turn, operates relays which influences normal operating current and the equipment concerned. A rather involved example is the *p*H controller. In this mechanism, the delicate electrodes are immersed in the liquid of which the *p*H is to be controlled. Variations in the hydrogen ion concentration causes changes in the E.M.F. These changes are detected by the sensitive electrode probes. Since a small current is flowing between the probes, the changes naturally affect the current flow. Slight as they are, the changes are multiplied many times by a vacuum tube with the final potential registered on a dial or chart. Actual recording is the result of magnetic deflection in some proportion to the current developed by the vacuum tube. The controller operates with direct current. This current also can be passed through relays and transformed to alternating current to operate motors for control mechanisms.

The Chemical Analysis of Black Spruce Wood

PAUL F. CUNDY, Research Assistant
The Institute of Paper Chemistry

▸▸▸ THE LITERATURE PROVIDES only meager and scattered data on the chemical constitution of black spruce wood. Because this is one of the principal woods used in sulphite pulping, the following analysis may be of use by providing a rather complete, unified picture of the major constituents present. The only other data appear to be those of McMillen, *et al.* (*Ind. Eng. Chem.* 30:1407 (1938)).

The sample was prepared from a single representative stick of Canadian black spruce pulpwood. A section two feet long, with an average diameter of five and one-half inches, was sawed from the center of the stick. After the bark had been removed and the knots bored out, the entire section was reduced to wood meal which passed the 40-mesh screen, according to TAPPI Tentative Standard T 11 m-42. A portion of the meal was fractionated and that portion retained on the 60-mesh screen was used in the determination of the cellulose content.

About 100 grams of extractive-free wood meal were prepared by extracting wood meal, which had passed the 40-mesh screen, with alcohol-benzene (1:2) in a Soxhlet for six hours and then with water at the boiling temperature for three successive one-hour periods. After thorough air-drying, this wood meal was used for all determinations requiring extractive-free material with the exception of the cellulose determination. For this, the previously fractionated 40-60 mesh portion was rendered extractive-free in the manner described above. The results follow:

	Per cent (**)
*Alcohol-benzene solubility (1)	2.2
*Hot water solubility (2)	2.1
*Ash	0.29
Cross and Bevan cellulose (3)	57.2
Alphacellulose on Cross and Bevan cellulose (4)	45.8
Lignin (5)	27.3
Pentosans (6)	12.5
Polyuronides (as CO_2) (7)	0.86
Mannan (8)	8.5
Methoxyl (9)	4.65
Acetyl (10)	1.16

(*) Unextracted wood meal was used. All other determinations were made on extractive-free wood.

(**) Calculated to oven-dry, unextracted basis.

The following footnotes refer to the methods employed in analysis. Wherever standards methods are used, they are listed by number or reference only.

(1) TAPPI T 6 m-41.

(2) Extraction for one hour with 100 ml. of water at the boiling temperature three times, successively, followed by drying and weighing of the residue.

(3) Methods used at the Forest Products Laboratory for the chemical analysis of pulps and pulpwoods, 1939. *Cellulose*, p. 12. The method was modified as follows: The 40-60 mesh fraction was used. The washing cycle (following chlorination) consisted of the steps: hot water, hot 2 per cent sodium sulphite solution, two 2-minute digestions with hot 2 per cent sodium sulphite solution, hot water, and cold water. Nine chlorinations were required.

(4) TAPPI T 203 m-40.

(5) TAPPI T 13 m-43.

(6) Association of Official Agricultural Chemists, "Methods of analysis." 5th ed., p. 361.

(7) Burkhart, B., Baur, L., and Link, K. P., *J. Biol. Chem.* 104:171-181 (1934). The method was modified by heating 15 minutes at 70 C. to free the system of carbonates before attaching the absorption tubes, and by the use of silver phosphate and phosphoric acid in the trap.

(8) American Chemical Society, Division of Cellulose Chemistry, "Tentative analytical methods for determination of mannan."

(9) TAPPI T 2 m-43.

(10) Freudenberg, K., Ann. 433: 230-237 (1923). The formyl content was negligible.

Core Waste Nomograph for Newsprint

D. S. DAVIS
Wyandotte Chemicals Corp.

▶▶▶ IN REWINDING NEWSPRINT and in other operations varying amounts of paper are left on the cores. The initial step in combating such losses consists in determining and reporting the weight of the residual sheet. The paper can be stripped from the core and weighed but a rapid and reliable estimate can be made from the measured depth of paper on the core or from the measured circumference of the nearly depleted roll.

Derivation of Equations

In connection with the inserted figure on the chart let

A=distance, core to edge of roll, inches

r=radius of core, inches

L=unwound length of paper in roll, feet

c=average caliper, inches.

Equating expression for the area of paper in an end view of the roll and the area of the edge when unwound,

$$\pi\left[(A+r)^2-r^2\right]=12\,L\,c$$

from which $L=\dfrac{\pi A\,(A+2r)}{12\,c}$ (1)

An alternative expression for roll length is

$$L=\frac{M\,(24)\,(36)\,(500)\,(12)}{144\,R\,b} \quad (2)$$

where M = weight of paper in roll, pounds

R = basis weight, pounds, 24" x 36", 500

and b = width of roll, inches

Eliminating L from Equations 1 and 2, and limiting 2 r, the core diameter, to 4 inches,

$$M=\frac{7.27\,R\,b\,A\,(A+4)}{c}\times 10^{-6} \quad (3)$$

Let P = the circumference of the nearly depleted roll and let p = the circumference of the core of diameter, d. Then $2A+d=P/\pi$

from which $A=\dfrac{(P/\pi)-d}{2}$

$$=\frac{P}{2\pi}-\frac{d}{2}$$

$$A+d=\frac{P}{2\pi}+\frac{d}{2}$$

and $A\,(A+d)=\left(\dfrac{P}{2\pi}-\dfrac{d}{2}\right)\left(\dfrac{P}{2\pi}+\dfrac{d}{2}\right)=\dfrac{P^2-p^2}{4\pi^2}$ (4)

The ratio R/c for newsprint may be taken as 10,426. When this value and Equation 4 are substituted in Equation 3 there results

$$M=0.0758\,b\,A\,(A+4)$$
$$=0.1920\,b\,(P^2-157.9)\times 10^{-2}$$

Use of the Nomograph

The equation is readily solved by the nomograph which is similar in essential design to an earlier chart (1) and which was constructed by methods described previously (2). The use of the nomograph is illustrated as follows: What is the waste for a 64-inch roll when 5/8 inch of newsprint is left on the core? Connect 5/8 on the A scale with 64 on the b scale and read the core waste on the M scale as 14 pounds. What is the waste for a 72-inch roll when the circumference of the nearly depleted roll is 21.5 inches? Connect 21.5 on the P scale with 72 on the b scale and read the waste as 42 pounds on the M scale.

The Calibrated Tape Method

For rolls of the same width the amount of core waste can be estimated very quickly through the use of a specially graduated cloth or paper tape reading in pounds directly. Thus, for 100-inch rolls,

$$M=0.1920\,(P^2-157.9)$$

and the circumference for any given weight may be calculated by the equation

$$P=\sqrt{5.208\,M+157.9}$$

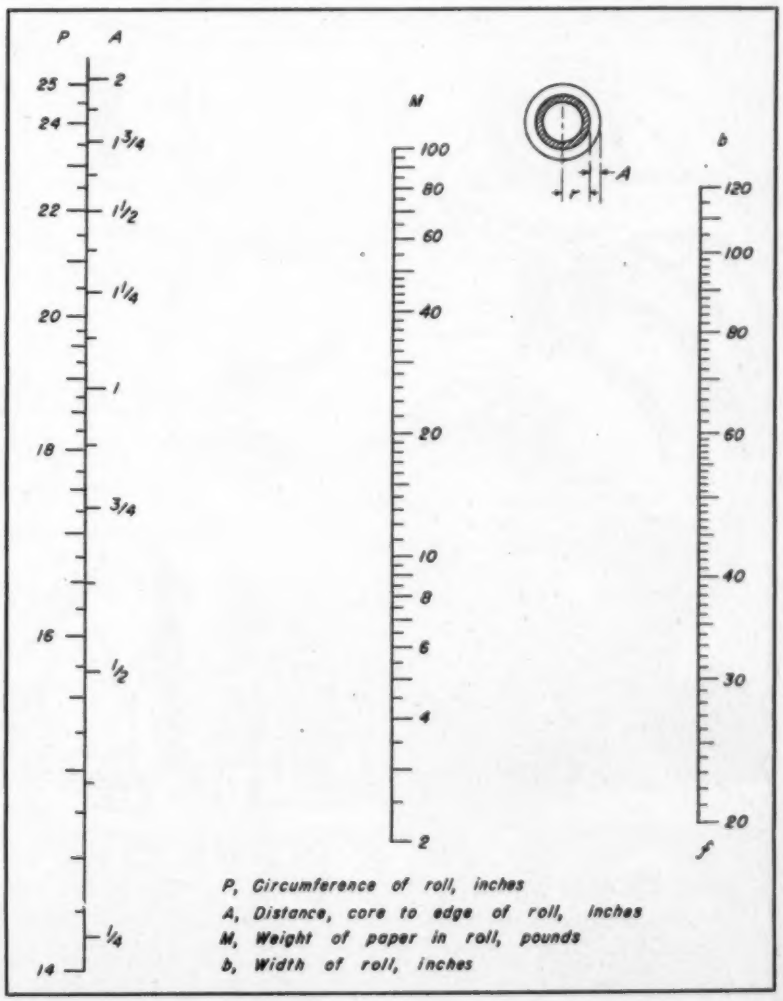
Illustrative values are tabulated as follows:

M, lb.	P, in.	M, lb.	P, in.	M, lb.	P, in.
10	14.49	25	16.97	55	21.09
12	14.85	30	17.72	60	21.69
14	15.19	35	18.45	65	22.28
16	15.53	40	19.14	70	22.85
18	15.86	45	19.81	75	23.42
20	16.19	50	20.45	80	23.96

Literature Cited

1) Davis, D. S., *Paper Ind. and P. World*, 24, 373 (1942), *Chemical Engineering Nomographs*, P. 88 (1944).

2) *Idem, Empirical Equations and Nomography*, p. 104 (1943).



PAPER SKETCHES

BOMB RINGS, MADE OF SEVERAL LAYERS OF PAPERBOARD IMPREGNATED WITH A MIXTURE OF UREA FORMALDEHYDE RESIN AND STARCH, PROTECT AMERICAN-MADE BOMBS FROM TRANSPORTATION SHOCKS AND OTHERWISE FACILITATE THEIR HANDLING FROM BOMB PLANT TO BOMB BAY OF A PLANE.

WINDOWS OF PAPER GREASED WITH HOG FAT OR BEAR GREASE WERE USED IN EARLY 19TH CENTURY CABINS IN CERTAIN PIONEER SECTIONS OF THE SOUTH.

THE WORD REAM IS FROM "REZMAH," AN ARABIC WORD MEANING "BUNDLE."

IN THE 1570's THE AZTEC NATIVES OF TEPOZTLAN, MEXICO, MADE A PAPER-LIKE SUBSTANCE FROM THE INNER BARK OF WILD FIG TREES, THAT WAS USED FOR RELIGIOUS VESTMENTS AND FOR FUNERAL EQUIPAGE. THIS SUBSTANCE COULD BE WRITTEN UPON, TAKING INK WITHOUT BLOTTING.

To serve you better

GREENE, TWEED & CO.

has acquired the facilities of

ASBESTOS FIBRE SPINNING CO.

GREENE, TWEED & CO., manufacturer of PALMETTO and other Self-Lubricating Packings, announces that it has acquired the facilities of THE ASBESTOS FIBRE SPINNING CO. of North Wales, Pa., manufacturer of asbestos textiles.

The combined facilities of the large modern plants of these two concerns are now united under a single management. All processes involved in the manufacture of asbestos packings and asbestos textiles are completely controlled—from raw material to finished products. Single management assures supplying your requirements for the high quality products shown at the right.

GREENE, TWEED & CO. Asbestos Packings

- **PALMETTO** . . . for steam, hot water, gases
- **PELRO** . . . for oils, solvents
- **CUTNO** . . . for alkalis
- **SUPER-CUTNO** . . . for acids
- **KLERO** . . . for foods, paper products
- **PALMETTO HIGH PRESSURE SPIRAL**
- **PALMETTO CAB COCK PACKING** . . . for high temperatures
- **SUPERSHEAT** . . . all-purpose sheet packing

ASBESTOS FIBRE SPINNING CO. Products

- Braided Tubing
- Carded Fibre
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- Gaskets, Handhole & Manhole
- Gaskets, Plumbing & Closet
- Metallic Sheet Packing
- Rope, Twisted and Braided
- Wick Packing
- Yarns, thread and cord

All correspondence should be addressed to
GREENE, TWEED & CO.
Bronx Blvd. at 238th St., New York 66, N. Y.

GREENE, TWEED & CO.

BRONX BOULEVARD AT 238th ST. NEW YORK 66, N. Y.

PLANTS: New York, N. Y. and North Wales, Pa.

ALLIED

GREENE, TWEED CO. ACQUIRES ASBESTOS FIBRE SPINNING CO.

A consolidation has just been announced which brings together two companies in the asbestos field. This consolidation has been effected through the purchase of the Asbestos Fibre Spinning Company, North Wales, Pennsylvania, by Greene, Tweed & Company, New York City.

Asbestos Fibre Spinning Company has been engaged primarily in the manufacture of asbestos textiles such as yarns, cloth, rovings, tapes, packings, etc. By this acquisition, Greene, Tweed & Company will greatly enlarge its present line of asbestos products and will also have an excellent opportunity for further expansion. The Asbestos Fibre Spinning Company was established in 1898 by George Shafenacker and Christopher Huber, and throughout its long history has been operated by the same family interests. Greene, Tweed & Company was one of its customers, having purchased their requirements of asbestos yarn from them for twenty-five years.

◆

▶▶▶ A NEW BRANCH OFFICE is announced by Fairbanks, Morse and Company of Chicago. It is located at 1335 Hunt Building, Tulsa, Oklahoma, and is under the management of Frank D. Ratcliffe, district manager of oil industry sales.

◆

▶▶▶ PURCHASE OF National Calibration Service, Brooklyn, New York, by Foster D. Snell, Inc., New York, consulting chemists and engineers, was consummated recently. The newly acquired company will be operated as a separate department, and the Snell organization will continue to serve those firms having contracts with the National Calibration Service, in addition to extending the service to other clients.

◆

SCALE BUSINESS OF KRON CO. TAKEN OVER BY YALE AND TOWNE

Purchase of the scale business of The Kron Company, Bridgeport, Connecticut, by Yale and Towne Manufacturing Company, New York, has been consummated, according to a recent statement by W. Gibson Carey, Jr., president of the latter company.

The Kron Company has designed, manufactured and marketed industrial scale equipment for more than a quarter of a century and it is understood that no changes in the line are contemplated except for natural developments growing out of the industry's needs.

The facilities and personnel of The Kron Company will be maintained in Bridgeport as heretofore, together with the sales and service organization, but all will be under the general direction of the Philadelphia Division of Yale and Towne Manufacturing Company.

◆

NEW GROUP ORGANIZED

A new organization has been formed which will be known as the General American Process Equipment Division of General American Transportation Corporation, Chicago. The companies comprising this new division include the Louisville Drying Machinery Company, The Conkey Company, The Turbo-Mixer Corporation, and the American Machine Company.

Headquarters of this new organization is located at 451 Baxter Avenue, Louisville 4, Kentucky. This new group will have at its disposal some of the most modern and efficient shops in this country for the manufacture of a wide range of processing machinery and equipment.

◆

▶▶▶ AT THE APRIL MEETING of the Sandy Hill Club, of the Sandy Hill Iron & Brass Works, twenty employees received awards totaling $270 for suggestions. The ideas submitted have been tried out during the past month. The awards are made on the basis of saving in cost of operation, increase in production, quality, or the safety of employees. The Club now has 106 members.

◆

BULKLEY, DUNTON INTRODUCES NEW COMPANY MAGAZINE

Taking its name from the well-known company seal, which depicts a full-rigged clipper ship, *The B. D. Clipper*, new house organ of Bulkley, Dunton Pulp Company, Inc., of New York, made its debut with the April issue.

The purpose of this new publication is two-fold; to tell the men and women in active service what is happening on the home front, and to bring news received from them to the attention of the principals and staff.

The Clipper was made possible through the generosity of the principals of the company and the enthusiastic co-operation of the staff. It will be amusing, entertaining, but always informative, and will circulate among all who have an active interest in the affairs and personnel of the organization.

Thirty-three men and women at present are on active duty, and the company employs approximately two hundred people throughout its various offices.

◆

ALLIS-CHALMERS CO. OFFERS NEW MOVIE

A sequel to its educational film on steam turbine operation, "The Magic of Steam" (Cf. P. I. & P. W. May, 1943), Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, now announces "The Surface Condenser."

As in the previous film, this release contains no advertising. Construction and operation of the modern surface condenser is demonstrated step by step, and the part it plays in the steam cycle of a power plant is explained by diagram, cutaway view and animation. The film concludes with an animation of the condenser in operation, and a diagram showing the complete power plant system, of which the condenser is a necessary part. Running time of the film is 18 minutes; making a full 40-minute program on turbines and condensers when used in conjunction with "The Magic of Steam." It can be used on sound projectors only. If desired, 16 mm. prints may be borrowed from the company, or they may be purchased at a cost of $24.00.

◆

PRES. OF B. F. PERKINS AND SON MADE GEN. MANAGER

J. Lewis Perkins, for many years president of B. F. Perkins and Son, Inc., Holyoke, Massachusetts, and well known in the paper and textile industries, has been elected general manager succeeding A. C. Lade. Mr. Perkins will assume the additional responsibilities of management.

William Woosnam was elected general sales manager. Mr. Woosnam for seventeen years was in charge of textile sales, and, more recently, was responsible for production on Navy and Merchant Marine contracts.

◆

LINK-BELT CO. OPENS WAREHOUSE IN SPOKANE

Faith in the industrial growth of the Pacific Northwest and the "Inland Empire" has caused Link-Belt Company, Chicago, to open a sales office

and warehouse in Spokane, Washington. This new office is located at South 151 Lincoln Street, and the zone is No. 8.

Eastern Washington, northern Idaho and a western portion of Montana will be served from the new office, and it is planned to enlarge both the space and warehouse stocks as conditions warrant. A representative line of power transmission, elevating and conveying equipment will be carried in stock, and Homer A. Garland will be in charge. Mr. Garland has been associated with Link-Belt since 1922, having in that year entered the employ of the company's Seattle warehouse.

◆

SCOFIELD GIVES SANDY HILL SALES RIGHTS IN INDUSTRY

An agreement recently negotiated between Gilbert J. Scofield, Inc., and the Sandy Hill Iron and Brass Works, Hudson Falls, New York, gives the latter company the exclusive right to manufacture and sell Gilbert Scofield products in the paper industry.

Because of Mr. Scofield's contribution to conservation of paper stock and felts through the Scofield Automatic Felt Conditioner, he was issued a special permit for building new equipment months ago, when war needs held up other machinery production. This arrangement will leave Mr. Scofield free for development work.

◆

ARMY-NAVY "E" AWARDS

Link-Belt Company, San Francisco, California—The award of the Army-Navy "E" to this plant, made it the fifth Link-Belt plant to be thus honored. Special ceremonies marked the presentation ceremonies; the address was made by Captain Joseph W. Fowler, U.S.N., Asst. Industrial Manager of the Mare Island Navy Yard. Attending the celebration of this event were several company officials and government representatives.

Shartle Bros. Machine Company, Middletown, Ohio — For the third time, this company has been honored by the Government for quality and quantity of production as per schedules. A second star has just been added to its "E" pennant which was won in April, 1943.

(A star denotes six months of continued excellence.)

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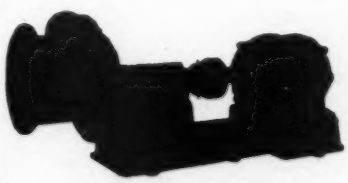

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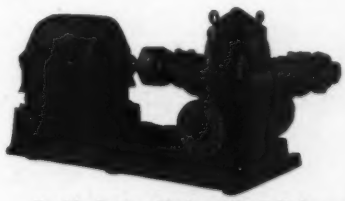

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CENTRIFUGAL PUMPS

ASSOCIATIONS

NW DIVISION SUPERINTENDENTS AND LAKE SHORE SECTION TAPPI MEET

The joint spring meeting of the Northwest Division of the American Pulp and Paper Mill Superintendents Association and the Lake States Section of TAPPI was attended by about 200 men of the industry. Seventy-five wives attended the banquet.

The meeting was held at the Hotel Wausau, Wausau, Wisconsin, on Saturday, April 22. The morning session was given over to several interesting talks on the following subjects:

"Postwar Paper Mill Equipment," Earl Otto, Consolidated Water Power & Paper Company, Wisconsin Rapids, Wisconsin.

These paper mill officials were photographed at the joint meeting of the Northwest Division of the Superintendents Association and the Lake States Section of TAPPI. Standing (L to R): Henry P. Baldwin, NW Div. Chairman; T. R. Probst, chairman Lake States Section, and L. J. Smith, second vice chairman of the NW Div. Seated are R. L. Eminger, national secretary-treasurer, and Ray Barton, national first vice president, of the Superintendents Association.

"Trends in Air-operated Controls for Machinery," R. G. Tower, Minneapolis district manager of the Bristol Company.

"New Methods of Tinning Bearings," R. E. Gest, Magnolia Metal Company, Elizabeth, New Jersey.

"Priorities and WPB Regulations," R. M. Radsch, Appleton Machine Company, Appleton, Wisconsin.

"Shafting Arrangements for Paper Machines," E. C. Jacobi, Green Bay, Wisconsin.

Erwin G. Artz, of E. G. Artz, Inc., Milwaukee, explained that a new mechanized lift truck may take the place of heavy electric trucks in some mill operations, and that young girls with this device are able to move a 6,300-pound load which would otherwise require three or four men to handle.

A luncheon session was held, and the afternoon was devoted to sectional meetings.

The main speaker at the banquet in the evening was D. C. Everest, president and general manager of the Marathon Paper Mills Company, Rothschild, Wisconsin. Mr. Everest is a past president of the American Paper and Pulp Association. He reviewed the past four years which have been difficult ones for the industry. He then turned to postwar obligations to employees, including men that have served in the Armed Forces. Present at the banquet was Fred C. Boyce, the first president of the American Pulp and Paper Mill Superintendents Association.

On Friday evening, preceding the convention meeting, the Chinese Paper Makers met at the Hotel Wausau and initiated 94 candidates. Each member was given a membership card bearing Chinese characters and recognizing Ts'ai Lun as inventor of papermaking nearly 2,000 years ago in China.

◆

PROTEST NEW LOADING RULES FOR PULPWOOD

The Association of American Railroads has published new loading rules for pulpwood shipped in gondola cars. These rules, applicable to wood over 6 feet long, provide for the use of either wire mesh or lumber along the entire length of each side of a car. Heretofore, wire mesh was used only on cars containing peeled wood; but this ruling covers either its use or lumber for rough wood as well.

While the rules are national in scope, they affect particularly shipments moving to, from, and within the states of Minnesota, Michigan, and Wisconsin. For that reason, the Wisconsin Paper & Pulp Manufacturers' Traffic Association and its member mills are protesting the rules, which are scheduled to become effective May 28, 1944.

Objections raised by the Wisconsin Paper & Pulp Manufacturers' Traffic Association include the following: Wire mesh, lumber and nails are practically unobtainable at this time. If these materials were available, the added labor and expense in using them would fall upon the shippers and upon mills which cut their own pulpwood. In the former case, the shippers would not assume the added expense; rather they would curtail production at a time when pulpwood is so badly needed. There also are some thousand or more small jobbers or farmers, many of them in isolated districts, who cannot be reached except by personal contact. Delay in reaching these operators probably would result in many cars being refused and held for reloading, thus delaying equipment and creating confusion generally.

◆

SUNDSTROM SPEAKS BEFORE MEETING OF EMPIRE STATE TAPPI

Principal speaker at the joint dinner meeting of the Hudson Valley group, Empire State section of the Technical Association of the Pulp and Paper Industry, and the American Pulp and Paper Mill Superintendents Association, held on the evening of April 14 at the Queensbury Hotel, Glens Falls, New York, was Fred A. Sundstrom, of the Heller and Merz Department of Calco Chemical Division of American Cyanamid Company, Bound Brook, New Jersey, who discussed research

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data on the retention of dyes in paper dyeing.

Vance Edwardes, national president of TAPPI, told of services available for association members at the national headquarters of the organization, and W. J. O'Brien, secretary-treasurer of the Empire State section, discussed the financial condition of the section and plans for an early summer meeting.

R. G. Macdonald, national executive secretary, spoke of the paper industry's contribution to the war effort, and of the new and hitherto unknown developments of paper packaging to take the place of tin and wood.

Speakers were introduced by Foster P. Doane, Jr., who presided over the meeting.

The next meeting will be held at the Queensbury Hotel, Glens Falls, on May 12.

◆

DR. KRESS ADDRESSES PRO PAPER GROUP

The Chicago Professional Paper Group held its sixth regular monthly dinner meeting at the Hotel Hamilton, Chicago, on Monday evening, May 1, 1944. Dr. Otto Kress, Technical Director of The Institute of Paper Chemistry, Appleton, Wisconsin, was the guest speaker of the evening. His subject was "The Fundamentals of Pulping."

In his presentation, Dr. Kress first highlighted the development of the papermaking industry. He mentioned papyrus as the forerunner of paper and likewise suggested that discovery of papermaking by T'sai Lun probably dated about 75 A.D. He mentioned that the art was carried into Europe by the Moorish Invasion and in referring to the permanency of the paper made at that time, added that no mill today can equal it. He called attention to the invention of the printing press; he mentioned that paper still was a very expensive commodity, and then referred to Louis Robert who, in 1798, laid the foundation for the development of what is now commonly known as the fourdrinier paper machine. He added that the Fourdrinier Brothers, London stationers, who financed the development of this machine, wrecked their fortune in doing so. During all of this period, Dr. Kress stated that investigators were searching for substitutes for rags; that Matthias Koops of England, presented a book on paper which he had manufactured from straw and that this book made its appearance in 1800. Attention was then confined to the modern processes of woodpulp manufacture; namely, groundwood, soda, sulphite and kraft. He emphasized the fact that wood is the logical raw material for paper manufacture as far as the United States is concerned.

After touching upon the chemical structure of wood and briefly outlining the sources of wood as well as logging practices, Dr. Kress then proceeded to describe briefly the handling of wood at the mills. He stated that there are only four variables in chemical pulping. These variables are unit weight of chemical, concentration of chemical, temperature and time element.

Stress was placed on the present serious situation in the pulp and paper industry, in reference to the inability of the industry to get wood. He emphasized the need for saving wastepaper to help out on the handling of this wood problem. To show how the industry is constantly shifting, Dr. Kress read a few statistics which compared the production figures and wood requirements for 1918 with 1940. Naturally, in such figures, the growth of the kraft industry was brought out very clearly and likewise the increased use of Southern pine also was definitely revealed.

A most interesting question period followed the presentation of Dr. Kress's general talk. The meeting was well attended, the attendance numbering approximately 130. The next meeting of the association is scheduled for Monday evening, June 5, and will be held at the Chicago Bar Association, 29 South La Salle Street, Chicago. The feature program for the evening is to be a three-act play showing a paper mill superintendent, a technical director and a paper jobber in action. The purpose of the play is to reveal something of paper technology as well as to explain some of the fundamental papermaking terms.

Tentative Program—American Pulp and Paper Mill Superintendents Association, May 23, 24, 25 and 26, Edgewater Beach Hotel, Chicago.

Tuesday, May 23rd

All-day reception and get-together for early arrivals
1:00 P.M.—Registration
7:00 P.M.—Affiliates' dinner

Wednesday, May 24th

9:30 A.M.—Business meeting, Stanford G. Blankinship, president, presiding
Invocation—Reverend Benjamin M. Will, Pastor, Country Church of the City, Chicago
In Memoriam—Robert L. Eminger, national secretary-treasurer
President's Message—Stanford G. Blankinship
Appointment of Committees
10:30 A.M.—General Conference, Stanford G. Blankinship, president, presiding
"Wood Supply"—Speaker to be announced
11:15 A.M.—"The Chicago Plan of Waste Paper Salvage," John R. Robinson, Chairman Chicago Salvage Drive, Chicago
12:20 P.M.—Luncheon. Toastmaster, Dwight Stocker, president, Michigan Paper Company, Plainwell, Michigan
Speaker—To be announced
2:30 P.M.—General Conference,
"Reemployment of War Veterans," Lawrence J. Fenlon, national chairman of American Legion Committee on Reemployment of War Veterans
3:30 P.M. — Joint Labor-Management Committees—
F. A. Denz, General Chairman, United Air Lines, Transport Corporation Employees' Suggestion Conference, 5959 S. Cicero Avenue, Chicago.
H. M. K. Grylls, Chairman Labor Management Committee, E. I. duPont de Nemours & Company, Grasselli Chemicals Department, East Chicago, Indiana.
Dine where you will. (Special tables available for dinner and entertainment in Marine Grill)

Thursday, May 25th

9:30 A.M.—Group Meetings
Chemical Pulp—Niles M. Anderson
Tissue Paper—A. M. Schmalz
Finishing, Storing & Shipping—Raymond L. Barton
Power & Plant Engineers—Raymond F. Bennett
Woodroom & Woods Operations—H. F. Hackworthy
(Papers and speaker to be announced)
Lunch where you will
2:30 P.M.—General Conference—Postwar Planning—Open Forum—Dr. Walter Hoffman, Supt. of Mfg., Fitchburg Paper Company, Fitchburg, Mass., presiding.
4:30 P.M.—Business Meeting for Association Members—Reports of Committees—Resolutions—Election of Officers
6:00 P.M.—Get-Together Party—Hosts—The Allied Industries
7:30 P.M.—Banquet (Informal)—Toastmaster, S. G. Blankinship, President
Presentation of Past President's Jewel
Presentation of L. D. Post Trophy
(Speaker—to be announced)
Dancing

Friday, May 26th

9:30 A.M.—Group Meetings
Board—James Rogers, II
Fine Papers—Homer H. Latimer
Coated Papers—Ronald Hynes
Kraft—Elmer M. Leavitt
(Papers and speakers to be announced)
12:20 P.M.—Luncheon—Toastmaster, T. E. Dial, chairman of Industrial Affiliates Committee (Speaker to be announced)
2:30 P.M.—General Conference (Speaker to be announced)

They Saved Money by Throwing Felts Away

There comes a point in every dryer felt's life when it begins to waste more money than its replacement involves. When its fibres lose their resilience and capillary attraction for moisture, the felt becomes waterlogged and inefficient.

A good example is the recent report from one mill which states that they found it possible to make a material saving in steam cost alone by discarding old dead felts with glazed-over and clogged weave, and installing new HOOPERWOOD Cotton Dryer Felts—enough saving in steam alone to pay for a new felt every week—not to mention the material increase in drying capacity and consequent greater production.

This is only one of many cases where progressive mills, today, are saving money, not by "stretching the life" of old felts, but rather by replacing them as soon as their drying efficiency begins to fall off. It is just plain good business.

Are your dryer felts costing too much per ton of production? We will be glad to discuss the problem with you and help you select the HOOPERWOOD Felt best suited to your requirements.

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SECOND CONFERENCE OF CHICAGO TECH. SOCIETIES

The second War Production and Related Problems Conference sponsored by the Chicago Technical Societies Council was held at the Stevens Hotel, Chicago, with an attendance of 4,000. This second clinic was held at the request of the WPB in co-operation with the Board and the Army and Navy, and drew enthusiastic and interested engineers, scientists, and manufacturers.

The conference was held in a series of 33 panel sessions in which all phases of war production and related problems were discussed. All panel discussions were led by recognized experts in their fields. The purpose of the conference was to expedite the war effort by providing a means for the exchange of mutually beneficial ideas among engineering, technical, and scientific societies, and interested manufacturers in the Chicago area. The spirit of co-operation between manufacturing and technical staffs was ample evidence that a large group of people could get together and work for the common good.

The Chicago Technical Societies Council is composed of representatives of thirty-six societies, including the newly formed Chicago Professional Paper Group. Its aims are: (1) to provide a medium for co-operative action by the engineering, technical and scientific societies in the midwest on matters of mutual interest which are beyond the scope of individual societies or which can be performed better by co-operative action; (2) to provide means for more effective public service by the member societies; and (3) to cultivate greater appreciation by the public of the part which the engineering, technical, and scientific professions have contributed to human welfare.

◆

"MODERN PACKAGING" EDITOR SPEAKS TO PRO PAPER GROUP

The program of the fifth regular monthly dinner meeting of the Chicago Professional Paper Group, held on April 3 at Hotel Hamilton, Chicago, was highlighted with two guest speakers. One of these speakers was Christopher W. Browne, editor in chief of *Modern Packaging;* the other, S. M. Hull, library research director of Western Electric Company.

Mr. Browne spoke on "The New Importance of Paper in Packaging"; Mr. Hull on the subject "Seek and Ye Shall Find."

In the presentation of the address by Mr. Browne, he early called attention to the fact that in World War I, packaging was inadequate and inefficient and then related that in this war packaging is being given expert attention. He commented that each shell has its individual carton; that emergency rations are packaged to remain edible whether sent to the tropics or the arctic regions; that blood plasma unheard of in the last war, is packaged and shipped all over the world ready for instant use, and that foods for lendlease shipments are dehydrated and packed in forms that occupy a minimum shipping space, and that they are protected from unpredictable hazards by modern scientific packaging methods and materials.

Officers of Chicago Technical Societies Council are: Standing: Paul S. Smith (left) recording secretary (Institute of Radio Engineers; K. H. Hobbie, corresponding secretary (American Society for Metals). Seated: (L to R) G. P. Halliwell, treasurer (Amer. Institute of Mining & Metallurgical Engineers); T. S. McEwan, president (Amer. Society of Mech. Engineers); B. E. Schaar, vice president (Amer. Chem. Society).

He cited some of the tests that paper must withstand in being substituted for tin cans, for metal collapsible tubes, for plastic sheeting, and for metal and plastic closures. These tests include inherent strength and structural rigidity, wet strength, moisture vapor or water vapor permeability, oil resistance to highly volatile oils as well as heavy lubricants, light resistance and toxicity.

The lessons which the paper industry has learned from its war packaging experience, Mr. Browne said, will result in many advances in the future. In his opinion, all package material makers, in looking ahead, will do well to get into close touch with the ultimate consumer. He cautioned to look for new movements of population, new habits of living that may affect your products, and suggested that you may be warranted in employing a research engineer to study the problem for you. Mr. Browne added that he knows at least one paper manufacturer who has employed a research engineer for that very purpose. Whether an outside consultant is employed or not, Mr. Browne made it clear that facts must be found—let them lead where they will.

To reduce the procedure to its simplest elements, he said to take each form of specialized paper being made or sold today and follow it through to its end uses, then ask which of these end uses will remain after peace comes. He called attention to the four functions of packaging: protection, economy, convenience and appearance and stated that a rigid application to these four functions will enable you to do your own postwar planning in packaging.

In concluding his remarks, he added, include in your plans provision for the fact that business will have to carry the heavy end of the reconstruction load; that production will have to be changed over to meet civilian requirements instead of military, perhaps for much of the world as well as for ourselves; that business and industry will have to reabsorb the returned soldiers and put them to work; that business through taxation must pay the lion's share of the war cost, and that postwar burden will demand courage of a high order—but the business men of America never have failed to come through with that kind of courage.

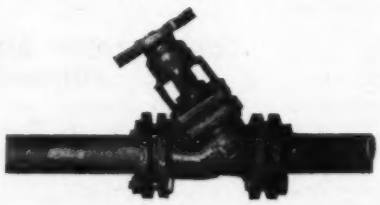
DURCO PRODUCTS HAVE BEEN HELPING RELIEVE SHORTAGES

Three years ago it was smokeless powder, TNT and explosives for Britain and America. Durco equipment went into scores of Ordnance Plants throughout this nation and Canada and there was plenty of powder when the shooting began.

Then came expansion of chemical plants, steel mills, metal refineries and new aluminum and magnesium plants —all putting Durco products on high priority.

More recently the "must" demand has been to equip synthetic rubber plants, high octane gasoline refineries, textile mills for making rayon, nylon and cordon, and a dozen new plants for producing atabrine and penicillin. Also products for landing craft and radar.

Now the movement is under way to relieve the paper shortage with new acid handling equipment made of Duriron, Durichlor or Durco Stainless Steels. For whatever you need to handle corrosive liquids, write us or consult our nearest Sales Representative.



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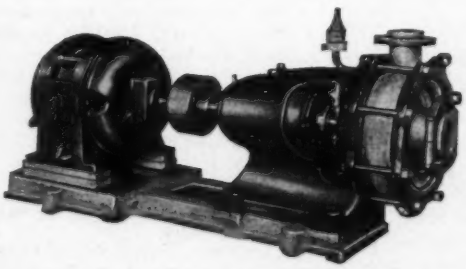

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DURCO PRODUCTS include a wide range of standard equipment, such as pumps, valves, pipe and fittings, alum dissolving jets, ejectors, tank outlets and laboratory equipment, as well as special castings made to your order, in the following Durco alloys:

DURIRON—a high silicon iron completely resistant to alum solutions and most commercial corrosives. Very hard and resistant to abrasion or galling. Does not contaminate solutions handled.

DURICHLOR—similar to Duriron in physical characteristics. Especially recommended for chlorine bleaches and hydrochloric acid at all strengths and temperatures up to the boiling point.

DURIMET—a special low carbon Stainless Steel particularly recommended for use in the presence of hot weak sulphuric acid and hot sulphite liquors. Also equally resistant to caustics.

DURCO STAINLESS STEELS—various analyses, all low carbon (0.07% max.), of the chrome-nickel and chrome-iron series.

ARMY E NAVY

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THE DURIRON COMPANY, Inc. DAYTON, OHIO

Mr. Hull presented a most inspirational talk. He has been with Western Electric for more than 20 years. His original job with the company was that of research chemist, but early after his association with the company, he lost most of his sight in a laboratory accident. At that time, he was placed in charge of library research work for the company and has functioned in that capacity ever since.

In his opinion, there is little that is new. Most everything that is thought up today, he believes, has its counterpart in something conceived years ago and possibly published in the literature. With patience and diligence, published references to many of these earlier developments, commented Mr. Hull, can be located. He stressed the growing importance of a knowledge of Russian in the handling of technical literature following the War. He likewise mentioned, in the work of translation, due to the difficulty in proper interpretation of technical terms, that it is advantageous to use a translator not native to the language from which the article is being translated. He related numerous incidents from his regular work to prove the worth of maintaining a fully qualified staff for library research.

Attendance at the meeting approximated 100.

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NEW ENG. SECTION OF TAPPI HOLDS DINNER MEETING

At a dinner meeting on April 21 in Hotel Kimball, Springfield, Massachusetts, John Westergaard, vice president of Castle and Overton Paper Company, New York City, speaking before members of the New England Section of the Technical Association of the Pulp and Paper Industry, said that Sweden has produced a million tons of chemical wood pulp for cattle feed since the War started and is getting from wood a considerable amount of alcohol which is used in a blend for even aviation gasoline.

The pulp, served with molasses, has been keeping alive cattle that otherwise would have had to be slaughtered before maturity because of the general European feed shortage.

Despite the nearness of the War, the Swedish pulp industry is intact, and Mr. Westergaard expressed the belief that three or four weeks after the War ends, Swedish ships carrying pulp to the United States, again will be on the high seas. Sweden has a substantial inventory of high quality pulp ready to be shipped on short notice, he stated. The forests of Norway have not felt the War to any large extent, but the mills have been operating for the benefit of Germany without repair or modernization, and show the effects of it.

Before the War, he continued, Russia produced about a million tons of wood pulp a year for internal consumption, and had imported some from Germany and the Scandinavian countries. Once it gets organized, Russia is capable of building an enormous pulp industry, but that will take some time.

Some of Finland's mills have been seriously damaged, but those in central and western Finland are intact and would allow Finland to come back into the export market fairly quickly after the European War is over. If Finland were to drop out of the War with Russia, he said, there still would be no home exports from there, any more than from Sweden at present, because land-based German aircraft could sink any ships sent to the United States.

S. B. Blankinship of New York City, president of the American Pulp and Paper Mill Superintendents Association, said that there is a large business ahead for the sulphite pulp industry and that inventories are being depleted and must be replenished. Paper consumption in this country is headed toward from 24,000,000 tons to 25,000,000 tons in 1950, he stated, and it is conceivable that wood fibers will be scarce at that time. New England will be down, the south up slightly in newsprint pulp; the west slightly up, with most of the gain to come from Canada.

Other speakers included Vance Edwardes, of Glens Falls, New York, national president of TAPPI, and R. G. MacDonald of New York, national secretary.

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NAT. ASSOCIATION OF FOREMEN HONORS CLARK EQUIP. OFFICIAL

The annual dinner of the Foremen's Club of Clark Equipment Company, Buchanan, Michigan, held recently at the Oliver Hotel, South Bend, Indiana, was marked by the presentation of a plaque to George Spatta, executive vice president and general manager, in recognition of meritorious service and constructive work performed by the company.

The plaque bore the National Association of Foremen Honor Roll, to which Mr. Spatta's name had been added, and was presented by H. J. Post, executive manager of the National Association of Foremen, and a former member of the Clark Foremen's Club.

Mr. Spatta came to Clark Equipment Company from General Electric Company in 1927 as a development engineer, and steadily advanced to his present position. He is largely responsible for the development of the company's tube mill and truck axle housing plant, as well as for the increased war production schedules of the four plants.

Frank H. Ireland of Delco Products, Dayton, Ohio, guest speaker, stressed the fact that the foreman is "management in action," and stated that American industry's inspiring war production record has, in a large measure, been due to the loyalty and enthusiasm of plant foremen.

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▶▶▶ THE FACILITIES OF the Washington, D. C., office of the American Paper and Pulp Association continue to afford a valuable liaison between the industry and the various agencies and departments of the Federal Government. The Association advises that during a recent typical month, more than 122 industry representatives personally used the facilities of the office while in Washington, and 106 direct mail inquiries were answered, in addition to numerous telephone inquiries.

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CONVENTIONS AND COMING EVENTS

May 21-24—Twenty-sixth annual meeting of the National Paper Box Manufacturers Association, at the Drake Hotel, Chicago.

May 24-26—Annual meeting of the American Pulp and Paper Mill Superintendents Association, at the Edgewater Beach Hotel, Chicago.

June 2-3—Joint meeting of Pacific Coast Division of the American Pulp and Paper Mill Superintendents Association and the Pacific Section of TAPPI at the Multnomah Hotel, Portland, Ore.

October 3-5—33rd National Safety Congress and Exposition at the Sherman, Morrison and La Salle Hotels, Chicago.

November 15-19—National Chemical Exposition at the Coliseum, Chicago.

STATED MEETINGS

Technical Associations of the Pulp and Paper Industry

Delaware Valley Section—First Friday of each month at the Engineers' Club, Philadelphia, Pa.

Kalamazoo Valley Section—First Thursday of each month, including June, at 6:30 P. M. at the Columbia Hotel, Kalamazoo, Mich.

Lake States Section—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

New England Section—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

Chicago Professional Paper Group

First Monday of each month except July and August, at Chicago.

Flexibility

• Our 78 years of service to the Paper Industry have included more than one period when, despite raw material limitations, ingenuity has enabled us to keep our paper manufacturing and paper converting customers supplied with high quality products.

Flexibility has always been our watchword. And so, although some of our standard starches, gums and dextrines may not be readily available at all times, our Paper Laboratories have developed alternate materials to serve the same purposes. Working with our field staff of paper technicians, our Paper Laboratories are ready to help you solve your sizing, calender, coating and adhesive problems.

• • •

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S A F E T Y

ASHLAND DIVISION OF MARATHON CELEBRATES FINE SAFETY RECORD

Because the Ashland (Wis.) plant of the Marathon Paper Mills Company finished three and one-half years without a lost-time accident, a family party was given recently to celebrate this fine record.

Approximately 248 employees attended an enjoyable evening which started off with a chicken dinner and musical program. It was, of course, fitting that the subject of safety should be highlighted, and two of the Marathon company's industrial relations directors were introduced as speakers. R. Ganzer, director of industrial relations of the Rothschild (Wis.) plant, told them that accidents don't happen —they are caused. He also stated that 80 per cent of all accidents are attributable to human failure, while 20 per cent can be attributed to mechanical failure. Walter E. Strong, director of industrial relations at the Menasha (Wis.) plant, also spoke on safe practices. Allan T. Pray, attorney, delivered an address which captivated his audience. He dramatized the origin of the Ashland plant and its development. He then applied the practice of safety to the welfare and happiness of the people of the community.

Company executives who spoke were : Ray J. Sund, director of operation at the company's Menasha, Wausau, and Ashland divisions; B. H. Metternich, manager of the Ashland division. On this occasion, Mr. Metternich presented Quarter of a Century Club members with a diploma. Mr. Metternich heads the list of old-timers with a record of 35 years of service. Regrets were expressed that D. C. Everest, president of the company, was unable to attend.

◆

▶▶▶ WOMEN DO NOT SHIRK heavy, disagreeable or dirty work in any industry, according to reports filed by the Women's Bureau, the WMC, the Office of Education, and the WPB. There are heavy, back-bending jobs which employers and unions do not regard as suitable for women, but the necessity to produce in record-breaking quantities has led to the removal of prejudices against the employment of women in one capacity after another.

◆

SAFETY SCORES

▶▶▶ IN THE ANNUAL Paper Industry Safety Contest which began July 1, 1943, reports received for March show eight mills maintaining a perfect record. These mills are:

Division I—Pulp and Paper Mills

Groups A and B—(None)

Group C—

Strathmore Paper Co. (Woronoco Mills), West Springfield, Mass.

Group D—

Marathon Paper Mills Co., Rothschild, Wis.

Spaulding Fibre Co., Inc., North Rochester, N. H.

International Paper Co., Riley, Me.

Division II—Paper and Board Remanufacturing

Thilmany Pulp & Paper Co., (Bag Mill), Kaukauna, Wis.

Kimberly-Clark Corp. (Atlas Mill), Appleton, Wis.

South West Box Co., Sand Springs, Okla.

Bay West Paper Co., Green Bay, Wis.

The paper industry safety contest is conducted among member mills of the Paper and Pulp Section of the National Safety Council, and runs for twelve months. The present contest covers the period July 1, 1943, to June 30, 1944.

STICKLE DRAINAGE AND CONTROL

UNIFORM DRYING
with Proper Moisture Content

● Uniform drying with Stickle Equipment means control so positive and so accurate that moisture content can be held within a variation of one-half of one per cent.

Stickle Control combines the tension principle of regulating steam valves with Stickle Thermal Control. In operation, after control is adjusted for the desired moisture content, Stickle Thermal Control maintains the moisture content at the desired point by its action in retarding or accelerating the steam flow as the sheet may become too dry or too wet.

In other words when variation in weight, free or slow stock, affects tension control, resulting in a sheet either too dry or too wet, Stickle Thermal Control automatically eases the situation by retarding momentarily, the natural action of tension control, which allows the thin or thick section in the sheet to pass across the roll at the weighted moisture content. However, should the sheet continue on the lighter or heavier side, tension control and thermal control act together and either retard or increase the steam flow as the drying conditions may demand.

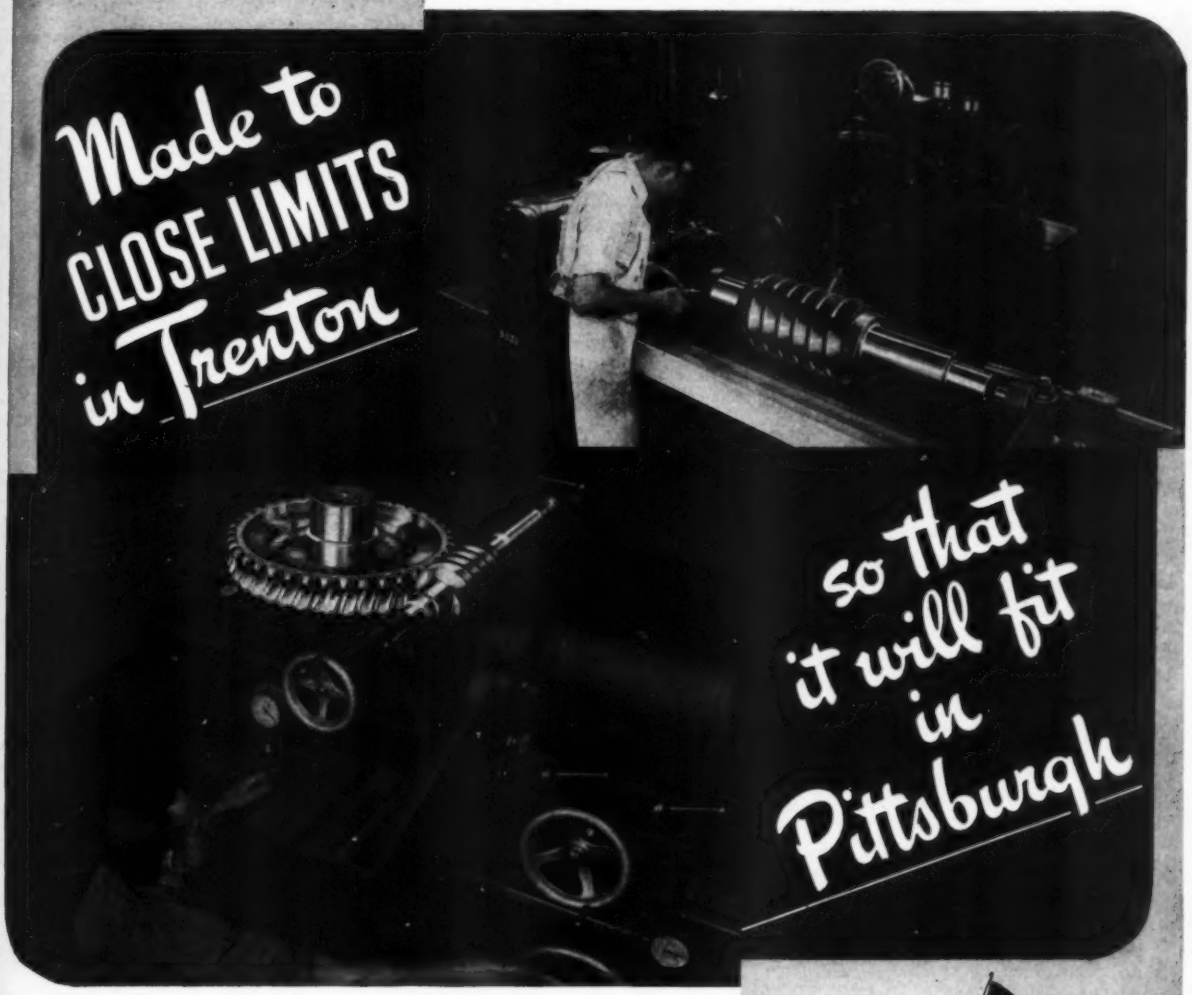
Stickle Visible Micro Adjustable Orifice. Supplied with or without indicating thermometer.

Results are: (1) Stabilization of steam flow resulting in a more uniform product. (2) Elimination of manual control to greatest possible degree. (3) Steam saving by checking over-heating of driers. (4) A better dried and a better quality sheet.

This is one of many advantages that has made Stickle Drainage and Control System the choice of the paper industry. Among other advantages afforded by the complete Stickle System are: Stabilized Steam Flow; Close Control of Moisture Content; Correct Drainage at all pressures; Visible Operation of each syphon; Improved Quality of product; Economy of Steam—greater tonnage in ratio to steam used; Increased Boiler Capacity; Reduced Fuel Costs; and Higher Production Capacity—increased speed of machines.

Stickle
STEAM SPECIALTIES COMPANY
2225 VALLEY AVENUE • INDIANAPOLIS, INDIANA
FOR 40 YEARS REDUCING STEAM COSTS IN PAPER MILLS

Checking thread dimensions of worm in thread grinder to match those of a master worm.



Checking tooth contact at exact center distance with worm center across gear, measurements being taken with a 1/10,000 inch dial indicator.

When you buy Worm Gear sets for building into your own machine tools, cranes, car loaders, conveyors, rolling mills, etc. you want to be sure that the parts are accurately machined to exact specifications and dimensions. Therefore specify DeLaval.

For the best results thread spacing on worms running at high pitch-line velocities must be accurate to within a few ten-thousandths of an inch. This degree of accuracy demands both precision production and precision checking.

M-28

De Laval **Worm Gear Division**
of the
De Laval Steam Turbine Co., Trenton 2, N. J.

MANUFACTURERS OF TURBINES . . . STEAM, HYDRAULIC; PUMPS . . . CENTRIFUGAL, CLOGLESS, ROTARY DISPLACEMENT, MOTOR-MOUNTED, MIXED-FLOW, PROPELLER; PRIMING SYSTEMS; CENTRIFUGAL BLOWERS and COMPRESSORS. GEARS . . . WORM, HELICAL, and FLEXIBLE COUPLINGS

NAMES *in the* NEWS

Personals

CURRIER PROMOTED AT THE SORG PAPER CO.

At the recent annual directors meeting of The Sorg Paper Company, Middletown, Ohio, L. C. Currier was elected to the executive committee and board of directors. He also was appointed mill manager, and production manager of the Oglesby, Smith and Sorg Divisions.

Mr. Currier received his Bachelor's Degree from the Massachusetts Institute of Technology in 1926 and entered the employ of the Berwin Paper Corporation, Dansville, New York, later becoming assistant superintendent. He joined the Sorg organization in 1930 and worked in the production department until 1938, when he was made manager of the Oglesby and Smith Divisions and assistant manager of the Sorg Division.

◆

LOUIS BLOCH IS HONORED FOR 50 YEARS OF SERVICE

A complimentary dinner was tendered Louis Bloch, chairman of the board, Crown Zellerbach Corporation, to celebrate fifty years of service with the C-Z Corporation and its predecessor companies. The dinner was given at the Palace Hotel in San Francisco, on April 5, and was attended by Mr. Bloch's family, personal friends, and business associates.

A number of presentations were made during the evening, signifying the love and esteem felt for Mr. Bloch by all groups represented.

Mr. Bloch's fifty years of service began with the Crown Paper Company, and a pin commemorating that term of service was presented to Mr. Bloch by Mrs. Ludwig Schwabacher, widow of the late vice president and general manager of that pioneer company.

J. D. Zellerbach, president of the Crown Zellerbach Corporation, acted as master of ceremonies, and he presented to Mr. Bloch a fine, de luxe testimonial, bound in leather and signed by thirty of his official associates of the Crown Zellerbach organization. Representing C-Z employees was William D. Welch, of the San Francisco office. The gift of the employees was a plaque in commemoration of his "Fifty Years of Accomplishment."

A most unique presentation was a "service pin" given by the timber department representatives present from the Northwest. This "service pin" was a carefully selected cut from a fifty-year old hemlock tree which began its growth in Crown Zellerbach forests of the State of Washington the same year that Mr. Bloch went to work as a paper finisher in the bag plant of the Crown Paper Company in San Francisco. In those fifty years the tree had attained a diameter growth of 14 inches and was 42 inches in circumference. Inset in the two-inch thick cut was a handsomely engraved gold plate on which was inscribed the timber department's congratulations and appreciation to Mr. Bloch for his fifty active and constant years of interest in "trees and men."

◆

NEW HONORS FOR DR. WILLARD DOW

Another signal honor has just been conferred upon Dr. Willard Henry Dow, president of The Dow Chemical Company, Midland, Michigan. Another, because just a year ago Dr. Dow was chosen by Columbia University as the Chandler lecturer and medalist for 1943.

The Gold Medal Award of the American Institute of Chemists for the year 1944 is the latest recognition given this distinguished research leader—the presentation was made at the annual meeting of the Institute held in New York City on May 13. Dr. Dow was chosen for this award for his outstanding work in producing magnesium and styrene, critical materials for airplanes and synthetic rubber respectively.

Dr. Willard H. Dow

In receiving this award, Dr. Dow enters a veritable hall of chemical fame. Former medalists include Andrew W. Mellon, former secretary of the treasury; James Bryant Conant, president of Harvard University; Marston Taylor Bogert, professor of chemistry at Columbia University, and Frederick G. Cottrell, noted inventor.

Dr. Dow was born at the scene of his present labors, Midland, Michigan, and destiny seems to have charted his life work. His father, Dr. Herbert Henry Dow, founded The Dow Chemical Company, and upon graduating from the University of Michigan in 1919, he went to work for the company. In 1922 he became a director and general manager of the company, and upon the death of his father in 1930, Willard Dow succeeded him. He has since become head of a number of associated companies which put into practical operation many of The Dow Chemical Company inventions and processes. He is affiliated with many of the national research and chemical organizations.

◆

NEW APPOINTMENTS AT H. K. PORTER, INC.

The following appointments are announced by H. K. Porter, Inc., Pittsburgh, Pennsylvania:

Joseph F. Gaffney is in charge of the new service and engineering office in Alliance Bank Building, Rochester, serving northern New York state.

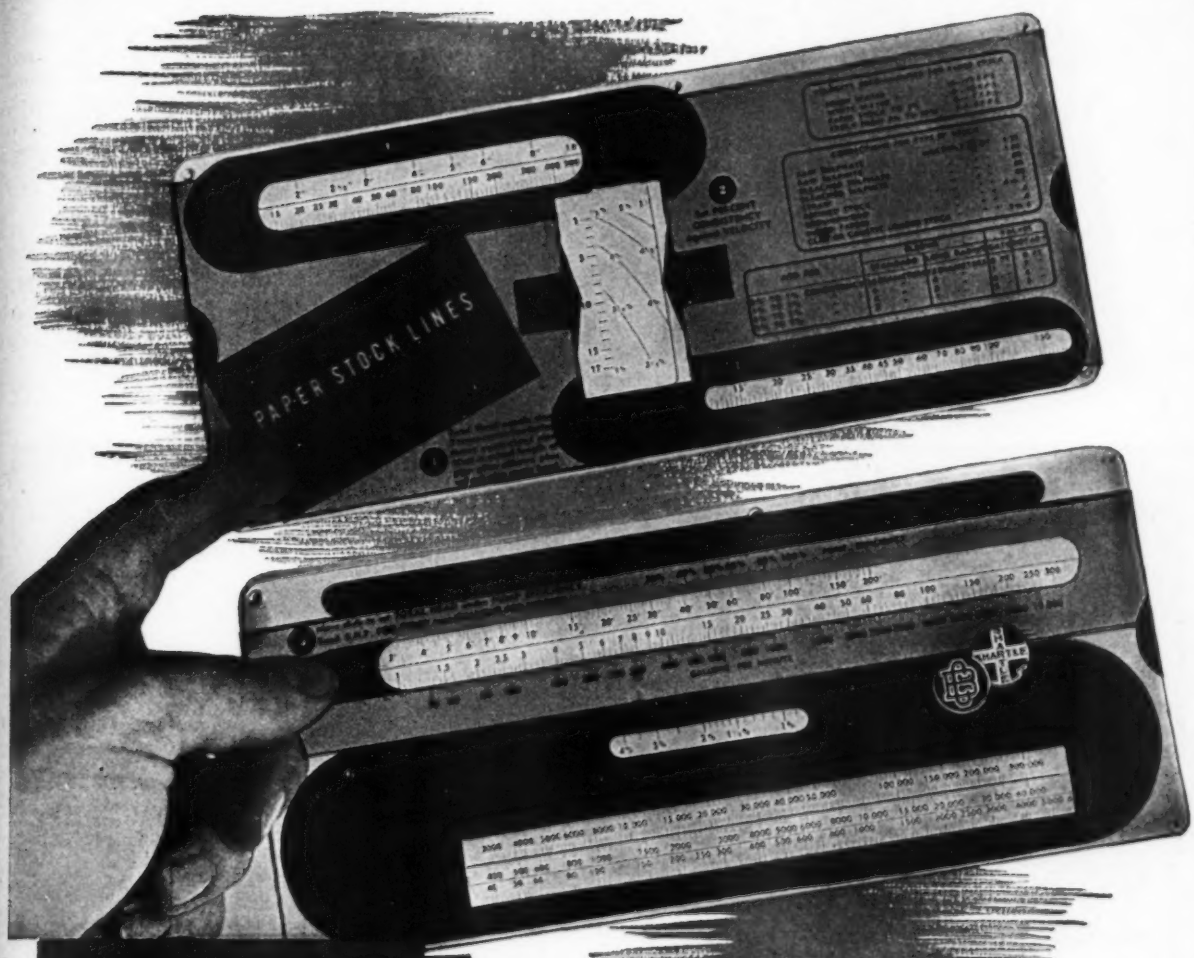
R. W. Steves heads a similar office in the Carew Tower, Cincinnati, for major portions of Ohio, Kentucky, West Virginia and Indiana.

W. T. Campbell is manager for the office in Girard Trust Building, Philadelphia, covering western New Jersey, eastern Pennsylvania and Delaware.

J. L. Cunningham has been appointed field service engineer for northern New Jersey for the Chemical Process and Quimby Pump Divisions of Porter. He will maintain headquarters at 340 Thomas Street, Newark, New Jersey.

◆

▶▶▶ At a recent meeting of the board of directors of Raybestos-Manhattan, Inc., Passaic, New Jersey, *Harry E. Smith*, general manager of The Manhattan Rubber Manufacturing Division



RIGHT NOW AND AFTER THE WAR

Every day the information this slide rule can give you will come in handy — prove valuable; for instance:

If I juggled my pipes, could I save pumping power?

If we increase tonnage, what changes are involved in our chests? In our pipes?

If I have choice of pipe sizes, which would prove more economical in the long run?

Would a pipe line handling raw sulphite handle same amount of raw sulphate with same power?

Send for yours, ON COMPANY LETTERHEAD, examine it, and let us know what you think of it. Do it today.

150 STOCK PREPARATION PROBLEMS SOLVED INSTANTLY — WITH THIS SLIDE RULE —

Yours FOR THE ASKING

This new B-C-S-D PAPER STOCK HORSEPOWER AND VOLUME CALCULATOR will help you figure pump capacities, pipe sizes needed, velocities of stock travel, discharge heads under varying conditions, brake horsepower, and many other factors, including chest capacities.

Problem: ***How many gallons per minute must a pump handle to equal 100 tons 24 hrs. of 3% stock,***

Solution: ***Move slide so 3% shows under arrow in center of rule (Step 6). Read over 100 tons at bottom of rule, 560 gallons per minute. (ans.)***

Problem: ***What is efficient size pipe for above pump handling 560 G.P.M. @ 3% consistency?***

Solution: ***From table "Velocity recommended for paper stock", we find 3% should be handled at 4 to 7 feet per second. In window No. 1 we set 560 G.P.M. in line with 7 feet velocity per second and read 6" pipe as economical size for this service. (ans.)***

This new, original and ACCURATE slide rule, (with many typical problems already worked out for you) is yours for the asking. Obtain yours from either Black-Clawson, Shartle or Dilts as preferred. Write now. Don't delay.

Dilts

SHARTLE BROS. MACHINE CO.

MIDDLETOWN, OHIO

Dilts Machine Works, Fulton, New York. Divisions of Black-Clawson Co., Hamilton, Ohio.

(Passaic), and *Robert B. Davis*, general manager of The Raybestos Division, Stratford, Connecticut, were elected vice presidents of Raybestos-Manhattan, Inc. Both Mr. Smith and Mr. Davis are members of the board of directors.

◆

SAM KLEIN NOW WESTERN SALES MGR. OF CALCO

On May 1, Sam Klein, newly appointed Western sales manager of Calco Chemical Division of American Cyanamid Company, took over his new duties and established offices in Chicago.

Sam Klein

Mr. Klein has been with Calco since 1917; for the past twenty years he has been in charge of its Lake Department. He has been in the dyestuff industry since 1907, first with A. Klipstein & Company, later with Read Holliday & Sons.

◆

PLASTIC ENGR. DIV. OF DOW CHEMICAL CO. HAS NEW ASST. MGR.

W. R. Dixon of The Dow Chemical Company, Midland, Michigan, has been appointed assistant manager of the Plastic Engineering Division.

Mr. Dixon joined the Dow organization in 1936 and was assigned to the Cellulose Products Division. In 1939, he was transferred to the New York office to handle cellulose products in the eastern territory, but was recalled to the home office in 1941 to handle many of the company's wartime plastic projects in consultation with Washington authorities. Mr. Dixon is a graduate of the University of Michigan and holds the degree of Bachelor of Science.

SPECIAL COMMITTEE HEADS PUSEY AND JONES RESEARCH DEPARTMENT

The greatly expanded research and development department of The Pusey and Jones Corporation, Wilmington, Delaware, is headed by a committee composed of men within the company and specialists from outside sources. It includes engineers, designers, laboratory technicians and production experts; men thoroughly familiar with metals, paper and papermaking machinery. The committee has been organized to study and analyze new ideas, theories, plans, materials, and techniques. Its responsibility is twofold; to help industry solve today's problems, and so to co-ordinate and develop these plans, materials and techniques that they will be available to American industry in practical, workable shape, the day Victory is won.

◆

▶▶▶ Effective April 1, *Robert Alderson,* for many years comptroller of American Tissue Mills, Holyoke, Massachusetts, was elected treasurer of the Springfield Bronze and Aluminum Company, Springfield, Massachusetts.

◆

AVERY STANTON IS PROMOTED BY MAGNUS

The appointment of Avery H. Stanton to the position of technical engineering consultant is announced by Magnus Chemical Company, Inc., Garwood, New Jersey. A graduate of the Massachusetts Institute of Technology, Mr. Stanton at one time was associated with Mason-Neilan Regulator Company, Boston, Massachusetts, and is well known in the pulp and paper industry.

Avery H. Stanton

Mr. Stanton's new activities include the relation of government agencies and the pulp and paper industry to industrial cleaning and process control compounds. He relinquishes Washington duties to take up his new assignment.

◆

LAWRENCE TO BE BULKLEY, DUNTON WEST. SALES REPR.

Bulkley, Dunton Company, New York City, announces that L. W. Lawrence has been appointed sales representative in the Western territory, which headquarters in Chicago.

L. W. Lawrence

Paul C. Staake, recently appointed to this position (P. I. & P. W., March, p. 1410), was unable to take over the work.

Mr. Lawrence has been in the mill supply business for 26 years. He represented the Schlafer Supply Company, Appleton, Wisconsin, for twenty years before becoming associated with Bulkley, Dunton.

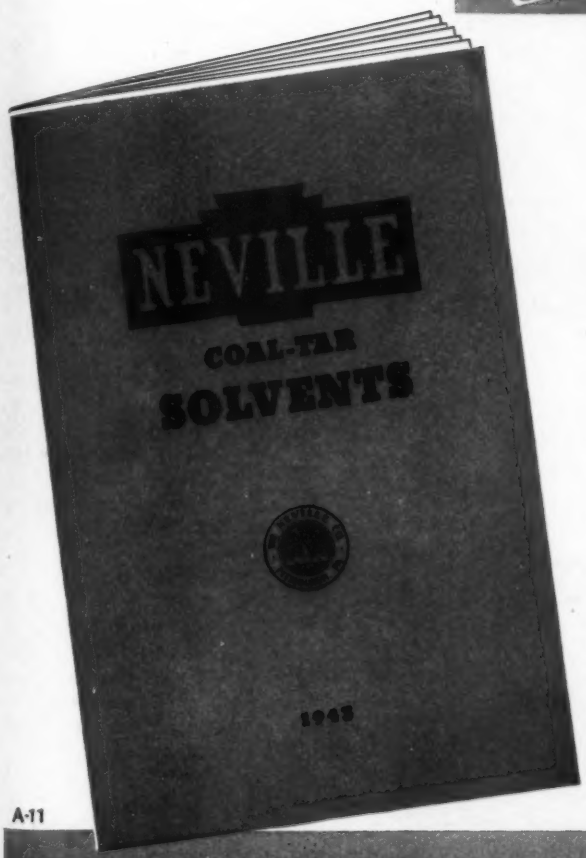
◆

AUSTIN COMPANY PUTS GANNETT IN CHARGE OF ENGINEERING-RESEARCH

Vice president of The Austin Company, Cleveland, Ohio, and eastern district manager since 1928, J. K. Gannett has been appointed director of engineering in charge of engineering and research.

Following five years' experience as field engineer, draftsman and designer, and supervising engineer for railroad, coal, steel fabricating and engineering companies, Mr. Gannett joined The Austin Company in 1915 as assistant chief engineer for the Cleveland district. He served as Paris (France)

NEVILLE Solvents



Experience has proved that coal-tar solvents are the most desirable for many difficult solvent problems. Neville has developed not only uniformly excellent solvents of standard distillation ranges, but also a number of new fractions. Neville offers a complete range of Coal-Tar Solvents to meet the widely varying requirements of Industry.

The grades, specifications and uses of these versatile solvents are fully described in this 40-page booklet. Write for your copy today.

A-11

THE NEVILLE COMPANY

PITTSBURGH · PA.

Chemicals for the Nation's War Program

BENZOL • TOLUOL • XYLOL • TOLLAC • NEVSOL • CRUDE COAL-TAR SOLVENTS
HI-FLASH SOLVENTS • COUMARONE-INDENE RESINS • GUANADINE NITRATE • TAR PAINTS
RUBBER COMPOUNDING MATERIALS • WIRE ENAMEL THINNERS • DIBUTYL PHTHALATE
RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

manager for the company during and after World War I, and was named New York district sales manager late in 1919, continuing in that position until his appointment as vice president and district manager.

He is a member of the American Society of Civil Engineers, American Welding Society, American Concrete Institute and the National Society of Professional Engineers.

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▶▶▶ *George V. Johnson,* assistant secretary of the Writing Paper Manufacturers Association, has resigned his position to accept a commission as Lieutenant (j.g.) in the Navy.

◆

MONSANTO MAKES NEIL SARGENT ASST. RESEARCH DIRECTOR

Assistant research director of the Merrimac Division of Monsanto Chemical Company, St. Louis, Missouri, is the new title of Neil A. Sargent. Mr. Sargent will share administrative and supervisory responsibilities with A. H. Bump, who also is an assistant research director under W. S. Wilson, director of research.

Mr. Sargent has been associated with Monsanto and predecessor companies since August of 1917 in engineering and research capacities. Most recently, he has been in charge of pilot plant operations and inorganic research.

Also announced is the promotion of Dr. Robert D. Swisher to serve as group leader in charge of organic chemical research for the Merrimac Division. Dr. Swisher has been associated with Monsanto since 1934 doing research in organic chemicals.

◆

▶▶▶ Commercial vice president is the new appointment recently given to *Walter D. Smith,* of Tulsa, Oklahoma. Mr. Smith has been connected with the Worthington organization since 1923, except for a period of three years. For the past four years he has been manager of the company's Tulsa district office, as well as southwestern manager of the engine sales division. In his new capacity, Mr. Smith will supervise the company's business in the Southwest.

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▶▶▶ Founder of the company and its former president, *E. G. Bailey* was elected chairman of Bailey Meter Company, Cleveland, Ohio, at an organization meeting held on March 30. *Robert S. Coffin,* former vice president, and identified with the company since 1916, succeeds him as president. *R. E. Woolley* was re-elected vice president, and *J. H. Black* is secretary treasurer.

PERSONNEL CHANGES AT JOS. T. RYERSON

The following changes in executive structure are announced by Joseph T. Ryerson and Son, Inc., of Chicago:

Harold B. Ressler, vice president, who has been located at the New York plant, will move to the executive offices

H. B. Ressler

in Chicago, where he will be in general charge of all sales in all territories.

Ainslie Y. Sawyer, assistant to the president, is elected vice president. He will continue at Chicago in general charge of purchases. Mr. Sawyer recently returned from Washington,

A. Y. Sawyer

where he served as deputy chief of the Warehouse Steel Branch of the WPB.

Harry W. Treleaven, assistant manager of the Ryerson New York plant, is appointed manager of that plant, which is located in Jersey City.

Thomas Z. Hayward, formerly in charge of tubing sales and priorities, now is appointed assistant general manager of sales.

Each of the above men has spent his entire business life with Ryerson.

◆

▶▶▶ A new location is announced for the New York office of Farrel-Birmingham Company (Ansonia, Connecticut). For many years at 79 Wall Street, the company's address now is 3700 Chrysler Building. Coincidental with this change, the company has appointed *Albert P. Leonard* manager of the New York office. He succeeds Edward S. Coe, Jr., who transfers to the main office at Ansonia to serve as assistant to the plant manager.

◆

BOSTON WOVEN HOSE PERSONNEL CHANGES

Owing to ill health, A. C. Kingston, vice president and general manager of Boston Woven Hose and Rubber Company, Cambridge, Massachusetts, is relinquishing a large part of his responsibilities, but has been appointed consultant to the president on matters of sales policy.

District sales manager of the New York and Pennsylvania districts for the past seventeen years, H. F. Maxon now is general sales manager. W. F. Carroll, resident representative in the Philadelphia district, succeeds Mr. Maxon as district sales manager.

W. I. Lewis, assistant to the general manager, has been made assistant general sales manager.

◆

▶▶▶ The appointment of *James P. Rubush* as vice president in charge of sales is announced by The Goslin-Birmingham Manufacturing Company, Inc., of New York, manufacturers of equipment for pulp, paper, chemical, sugar and allied industries.

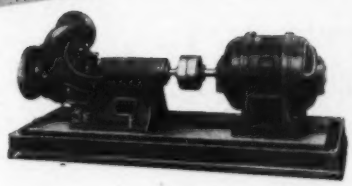
◆

▶▶▶ The appointment of *Carl L. Wallfred* metallurgist at the Battelle Memorial Institute, Columbus, Ohio, as manager of the pilot plant department for Ansul Chemical Company, Marinette, Wisconsin, has been announced. Mr. Wallfred took over his new duties on April 1.

◆

▶▶▶ A member of the technical department of Marathon Paper Mills Company, Menasha, Wisconsin, until his enlistment in the U. S. Air Forces in January, 1942, *Captain Donald G. Westerbeke* is reported missing in action over Germany. He recently received the distinguished service cross for action in the famous low level bombing attack on the Ploesti oil refineries in Rumania.

IF "PREPARING FOR PEACE"
★ includes Pumps ★
SEE GOULDS NOW



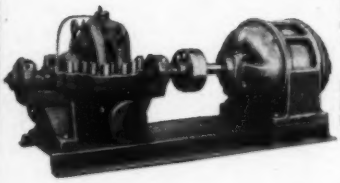


Fig. 3720 Single stage enclosed impeller direct connected centrifugal.

Fig. 3380 2 stage opposed impeller type centrifugal.

It it shows foresight to say "In time of peace prepare for war," it's certainly doubly foresighted to reverse that phrase and say "In time of war prepare for peace."

That's just what many forward looking companies are doing right now. We know something about their post war plans* because already they are turning to Goulds, as progressive companies have been doing for 96 years, for sound engineering counsel on their anticipated requirements for peace time operations.

Many users of pumps bring their entire liquid handling problem to Goulds. They know that from Goulds they get unbiased recommendations for *the pump for the job.* And usually they can get that pump from Goulds whether the one best suited is reciprocating, rotary or centrifugal, whether 5 g.p.m. or 16,000 g.p.m., because Goulds makes them all.

If you are "preparing for peace" and your plans include pumps, we are ready now to discuss those plans with you and share with you what we have learned about better and more efficient ways to solve pump problems.

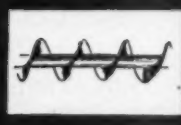
*If the products or services of those companies are directly connected with the war effort, Goulds Pumps are *available now* on priority A statement of your highest available priority will enable us to quote best possible delivery

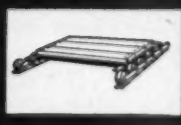
Goulds
PUMPS, INC.
SENECA FALLS, NEW YORK

For NON-STOP PRODUCTION
Rely on Jeffrey for Plans and Maintenance Parts

Keeping production moving without a break is more important now than ever. Fast-moving production lines require dependable and sturdy equipment . . . the kind that Jeffrey builds.

Jeffrey not only furnishes the right maintenance items such as idlers, chains, elevator buckets, apron and spiral flights, sprockets and transmission machinery . . . but also can supply technicians and engineers to help you coordinate your material handling requirements into a smooth-running system.





The variety of use for Jeffrey conveyors, bucket elevators, feeders, screens, crushers and vibrating equipment is almost limitless. For good parts, for rapid delivery of all kinds of material, for a well-organized handling system—think of Jeffrey first.

ESTABLISHED 1877

FELIX N. WILLIAMS WILL SUCCEED THE LATE JOHN C. BROOKS

As successor to the late John C. Brooks, (See Necrology), Felix N. Williams, production manager of the Phosphate Division of Monsanto Chemical Company, Anniston, Alabama, has been made general manager of the Plastics Division at the Monsanto Springfield (Mass.) plant.

Mr. Williams became associated with the Swann Chemical Company following his graduation in 1923. This company was later acquired by Monsanto. He has held a number of important managerial positions in the organization, having had a part in the designing and construction of plants.

◆

▶▶▶ Since 1942 assistant director of the public relations department for E. I. du Pont de Nemours and Company, Inc., Wilmington, Delaware, *Harold Brayman* now is appointed director. He succeeds the late Theodore G. Joslin, who passed away April 12.

◆

CLYDE BENSON NOW WITH ARNO NICKERSON

Announcement is made that Clyde A. Benson has joined the staff of Arno W. Nickerson, chemical engineer, New York City.

Mr. Benson is a chemical engineer, a graduate of M.I.T., and for sixteen years he has worked exclusively in the paper industry. In the Nickerson organization, he will be engaged in development work in connection with protective packaging for frozen foods, dehydrated foods, and dairy products.

On May 1, Mr. Nickerson's offices were moved to 441 Lexington Avenue, New York, where he occupies larger offices than at the previous location.

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▶▶▶ Long a prominent figure in trade association circles in the glassine field, *Robert F. Nelson* has been elected president of the Glassine Paper Company West Conshohocken, Pennsylvania.

◆

SULLIVAN MACH'Y ELECTS TWO NEW VICE PRESIDENTS

J. A. Drain, Jr., is newly elected vice president in charge of product engineering, research and development for Sullivan Machinery Company, Michigan City, Indiana. Also elected vice president in charge of sales in the United States and Mexico is O. J. Neslage.

Prior to his new appointment, Mr. Drain was assistant to the president, and at one time was president of the Stefco Steel Company. Mr. Neslage formerly was general sales manager.

◆

▶▶▶ *M. E. Clark*, former manager of market research of Michigan Alkali Division of Wyandotte Chemicals Corporation, Wyandotte, Michigan, has returned to his company as assistant

M. E. Clark

director of technical service and manager of market research. Mr. Clark was granted a leave-of-absence in July, 1941, to accept special duties in Washington.

◆

WESTINGHOUSE HAS FOUR NEW VICE PRESIDENTS

Announcement is made by the Westinghouse Electric and Manufacturing Company of the election of four new vice presidents.

The new officers and their former positions are: R. A. Neal, manager of the Switchgear Division at the East Pittsburgh works; J. K. B. Hare, manager of the company's Central District sales activities with headquarters in Pittsburgh; John H. Ashbaugh, manager of the Westinghouse Electric Appliance Division, with headquarters in Mansfield, Ohio; and H. H. Rogge, manager of the company's Washington Government Office.

◆

▶▶▶ Formerly associated with the Johns-Manville Sales Corporation of New York, *E. W. Smith* has been appointed vice president and director of sales for the Philip Carey Manufacturing Company of Cincinnati.

MANAGERIAL CHANGES AT M AND O COMPANY

Four major changes have taken place in the management of the Ontario-Minnesota Pulp and Paper Company of Minneapolis, Minnesota.

D. M. McLeod, vice president of the Canadian company since 1936, has retired. He is succeeded by Ralph Bateman, general manager since 1936. Former assistant to the general manager, S. C. Stratton has been appointed general manager in charge of Canadian operations. At the Fort Frances (Ontario) mill, F. W. Woodman, general superintendent, now is resident manager.

◆

▶▶▶ Since May, 1942, with the WPB as deputy chief of the Alloy Steel Branch, *James F. Reid* now returns to The Timken Roller Bearing Company, Canton, Ohio, as production manager, with activities and responsibilities extending to all divisions of the company. Prior to his Washington appointment, Mr. Reid was production manager of the Steel and Tube Division.

◆

CHANGES AT PENN SALT

Personnel changes at Pennsylvania Salt Manufacturing Company, Philadelphia, are announced as follows:

Thomas Toovey is transferred from sales service to the research and development department, and will supervise research and development work related to new and improved pulp and paper chemicals.

Other new additions to this department include: Dr. R. D. Evans, E. A. Bruce, F. W. Jakob, J. L. Staubly, J. M. Swales, J. J. McBride, Katherine Dilworth and Gertrude Schutze. Margaretta E. Aeugle and Gladys Molyneux are new staff members.

◆

▶▶▶ The election of *Robert R. Richardson* as vice president of The Gardner-Richardson Company, Middletown, Ohio, is announced by E. T. Gardner, company president. Mr. Richardson will retain his responsibilities as secretary. *Charles L. Keller* was elected chairman of the board.

◆

ROBERT S. PEARE NEW GENERAL ELECTRIC PUBLICITY MANAGER

Robert S. Peare, manager of publicity and broadcasting for the General Electric Company, Schenectady, New York, since 1940, and chairman of the general advertising committee, has been elected a vice president by the board of directors, according to a

THE DEGASIFICATION OF WATER

SINCE 1885 Cochrane engineers primarily have designed and applied equipment for the heating, degasification, and chemical treatment of boiler feed water. Naturally, in more than fifty years of such activity, problems were encountered requiring equipment to condition and degasify waters of unusual physical and chemical characteristics. For example, feed water deaerating equipment to operate at pressures ranging from sub atmospheric to over 125 lbs. per sq. in. has been designed and installed. Equipment for deaerating cold water at temperatures as low as 35 deg. F., and other equipment for removing carbon dioxide, hydrogen sulphide and ammonia have been furnished in large as well as in relatively small capacities.

The problem of removing dissolved gases from water may be quite complex, as coordinating a design and determining a guaranteed performance involves a thorough analysis of temperatures, gas pressures, viscosities, ionization, division of water and vent rates. An apparatus designed to remove oxygen to "zero content" is quite inadequate for removing a small quantity of ammonia. Likewise, a decarbonator designed to remove large quantities of carbon dioxide may not be suited to remove hydrogen sulphide.

Knowledge of these factors and their relative importance in the design of degasification apparatus is a part of Cochrane experience and is supported by tests and data from actual installations, placing us in a position to quote on equipments for degasifying water irrespective of their size.

Outstanding Cochrane equipments vary in size from 1000 lbs./hr. to 45,000,000 lbs./hr., indicating the broad coverage of Cochrane experience.

The purpose of this bulletin is to point out briefly some of the problems of degasification and to indicate generally the equipment used in the solution of these problems.

[1]

A NEW PUBLICATION YOU WILL WANT TO EXAMINE

The booklet shown on the right, from which the above page is taken, describes concisely many pieces of equipment designed and manufactured by Cochrane for the removal of Ammonia, Carbon Dioxide, Hydrogen Sulphide, Oxygen and other gases from Process and Boiler Feed Water. Write for a copy mentioning any specific water problem in which you may be interested.

COCHRANE CORPORATION 3114 N. 17th St., PHILADELPHIA 32, PA.

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SOFTENERS • DEAERATING SOFTENERS • DEAERATORS • METERS • STEAM SPECIALTIES

recent announcement by Gerard Swope, company president.

In his new position, Mr. Peare will direct the company's advertising, broadcasting, and general publicity activities, as a member of the president's staff.

◆

▶▶▶ *Lieutenant-Colonel H. M. Jacquays,* formerly of the sales department of the Hinde and Dauch Paper Company of Canada, Toronto, Ontario, has been appointed to succeed the late Lieutenant-Colonel A. J. L. Pritchard, as chief instructor of the Officers' Training Center at Brockville, Ontario.

Necrology

THOMAS G. HENDERSON

For many years superintendent of the Bird and Son, Inc., felt mill at Phillipsdale, Rhode Island, Thomas G. Henderson passed away on April 11 at the age of 62.

During his many years as superintendent, the Phillipsdale plant achieved many fine records in production and safety. In October, 1937, the plant was awarded the major trophy of *The Paper Industry* and the National Safety Council, Group B, in a national paper and pulp safety contest. (*Paper Ind.* Nov., 1937, p. 961.) In November of the same year the Division completed the best no-accident record ever achieved by a Bird Company plant, working 1,043,647 man-hours without loss of time due to accident.

In January, 1942, Mr. Henderson relinquished his duties as superintendent, but continued to serve the new superintendent, Joseph A. Sheehan, in an advisory capacity.

His widow, a son and a daughter survive.

◆

▶▶▶ *Charles V. Caesar,* a former official of E. B. Eddy Company, Ltd., Hull, Quebec, passed away on April 6 in Miami, Florida, at the age of 66. Mr. Caesar was associated with the company for many years, and served as managing director prior to his retirement in 1938. He is survived by his widow.

◆

JOHN C. BROOKS

Vice president and director of Monsanto Chemical Company, St. Louis, Missouri, and general manager of the Plastics Division at Springfield, Massachusetts, John C. Brooks passed away recently.

Following graduation in 1908 from the Massachusetts Institute of Technology, Mr. Brooks entered the plastics industry in 1922 as general manager of the Fiberloid Corporation, and later became its president. When this company became the nucleus of the Monsanto Plastics Division, Mr. Brooks was appointed a vice president of Monsanto Chemical Company and general manager of the Plastics Division. He also was president and director of Shawinigan Resins Corporation, a Monsanto affiliate.

He leaves his widow and two daughters.

◆

PAUL L. HOUSTON

President and director of The Marvellum Company, Holyoke, Massachusetts, and widely known in the paper manufacturing industry throughout that area, Paul L. Houston, 53, passed

Paul Houston

away in Springfield, Massachusetts, on April 14.

A graduate of Yale, class of 1913, Mr. Houston learned the paper business with the American Writing Paper Corporation. From 1919 to 1923 he was connected with the Bureau of Standards in Washington and later became the owner of the Centennial Mills in Kinderhook, N. Y., which he operated until 1928, at which time he joined The Marvellum Company.

Surviving are his widow, Margaret, and two sons, Corporal Whiting S., of the U. S. Army, and Stanley L., of the U. S. Navy.

◆

▶▶▶ *William Hingston Johns,* chairman of the board, and former president of the advertising firm of Batten, Barton, Durstine and Osborn, New York, passed away on April 17. He was 76 years of age.

▶▶▶ International representative of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers, *Rasmus Anderson,* 53, passed away on April 16 at Green Bay, Wisconsin. Mr. Anderson at one time was with the Hoberg Paper Mills of Green Bay, but left in 1937 to become international representative of the union. He is survived by his widow and three daughters.

◆

▶▶▶ Purchasing agent for the T. B. Woods Sons Company, Chambersburg, Pennsylvania, *C. J. Zullinger* passed away on April 15.

◆

THEO. G. JOSLIN

Theodore G. Joslin, 54, director of public relations for E. I. du Pont de Nemours and Company, Inc., Wilmington, Delaware, passed away on April 12.

Mr. Joslin served as secretary to President Hoover during his term in the White House, and later was a Washington correspondent for newspapers and national magazines. He left the journalistic field in 1939 to head the Du Pont public relations department.

Surviving are his widow and two sons; Richard H., with Du Pont's Nylon Division, and Lieutenant Robert E. Joslin, of the United States Army.

◆

▶▶▶ *Bion B. Farnham,* one of the founders of the Farnham Manufacturing Company of Buffalo, New York, and for many years a leading engineer in the paper mill industry, passed away on March 30 in Johnsonburg, New York. He was 77 years of age. Mr. Farnham designed and installed machinery for many large paper mills in the east and held patents on several inventions in the paper industry.

◆

WILLARD T. LIBBY

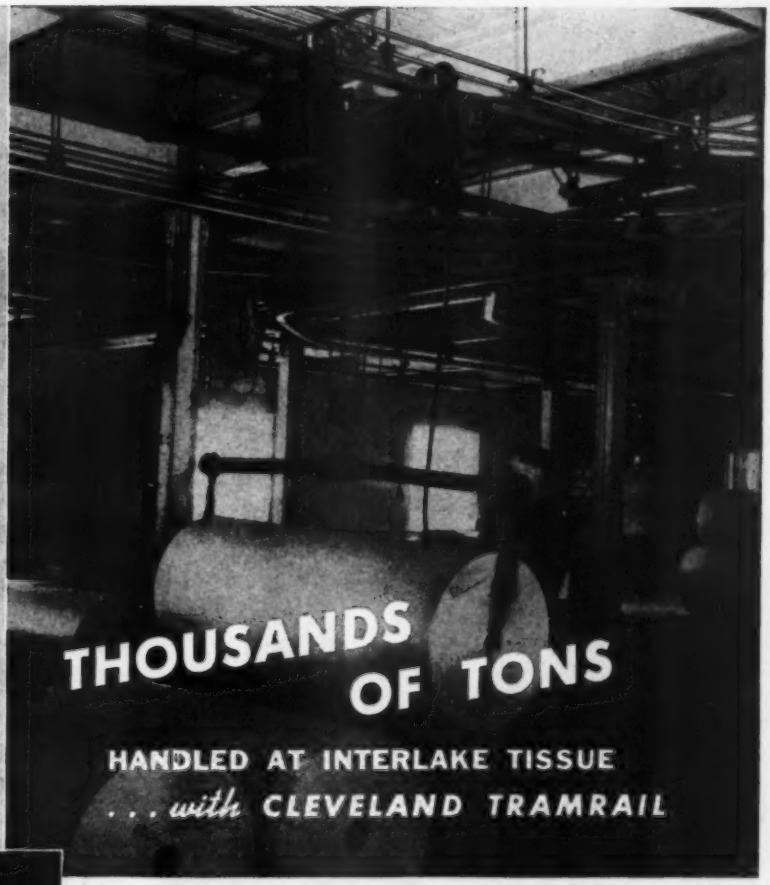
Associated with the Claremont Paper Company, Claremont, New Hampshire, since 1932, and only recently appointed sales manager for the company, Willard T. Libby passed away on April 3. He succeeded George M. Wetmore, former company sales manager, who was accidentally killed while cleaning an automatic pistol at his cabin on the grounds of the Camp Fire Club of America.

◆

▶▶▶ New York sales manager for the Claremont Paper Company, Claremont, New Hampshire, and associated with the company for fifteen years, *Willard True Libby* passed away in New York on April 3 at the age of 67. His widow and son survive.

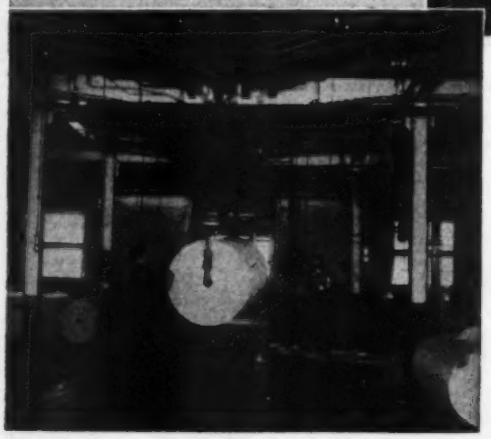
Right: Because of the Cleveland Tramrail system more rolls can be stored in this storage room. The rolls can easily be piled two or three high. Aisle space may be reduced considerably.

Below: The many rails covering the room converge to a central rail over which all rolls going into or out of storage are conveyed. Easy sliding switches make it a simple matter to switch to or from any rail.



THOUSANDS OF TONS

HANDLED AT INTERLAKE TISSUE ... *with* CLEVELAND TRAMRAIL



Thousands of tons of famous Interlake toilet tissue, hand towels and napkins have been handled on the Cleveland Tramrail system at the Interlake Tissue Mills Co., Ltd., Merriton, Ontario, since it was installed in 1929.

The rolls, which weigh from 650 to 1000 pounds, are picked up with electric hoists and delivered from the slitting machine to storage room and thence to the cutting and wrapping machines. About 75 rolls are easily handled per day over the smooth rails by one man.

The Tramrail system is laid out to provide complete coverage of the storage room which has a capacity of 250 rolls. Rolls may be delivered to or transported from any part of the room.

Since installed the Cleveland Tramrail system has been used continuously. It has always performed satisfactorily and has never required anything more than minimum maintenance.

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CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

LEAKY VALVES DON'T HELP PRODUCTION...

So Keep 'Em Tight

Fig. 1430
Iron Body Gate

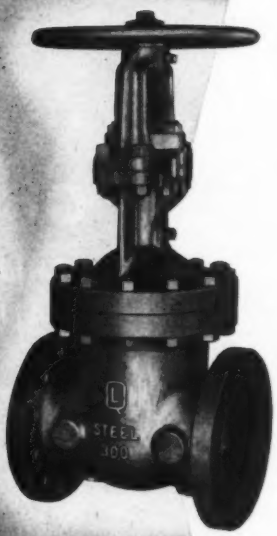


Fig. 1938
Steel Gate

The time necessary to maintain a careful check on valves . . . to see that they are kept tight and in good working order . . . is time well spent. Valves are tremendously important links in any production schedule.

Valve leakage of steam, water and air is not only costly in itself . . . it slows down production and can, if neglected, lead to serious delays and the loss of valuable time.

Lunkenheimer Valves, of whatever type, with their simplicity of design and built-in lasting qualities, are good insurance against production delays due to valve failure. They are helping many a maintenance crew do a better job easier.

A Lunkenheimer distributor is near you to assist you with your maintenance and operating problems. His facilities and experience are at your call.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

CINCINNATI 14, OHIO, U. S. A.

NEW YORK 13 CHICAGO 6
BOSTON 10 PHILADELPHIA 7

EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

Fig. 1440
"King-size" Gate

Fig. 2125
Bronze Gate

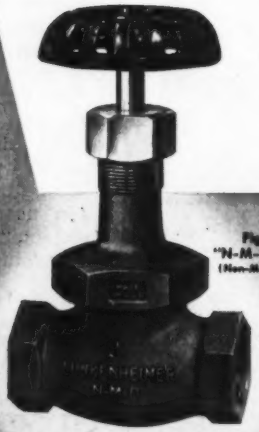


Fig. 133
"N-M-D" Globe
(Non-Metallic Disc)

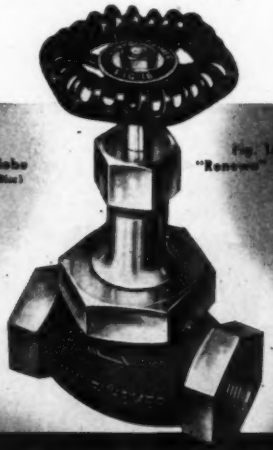
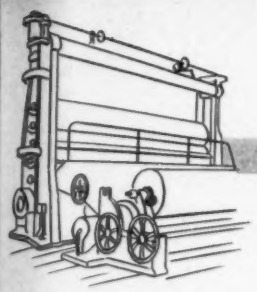
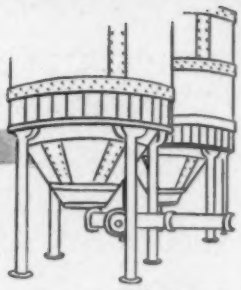


Fig. 1a
"Renewo" Globe

LUNKENHEIMER VALVES



Practical SHORTS



Readers are invited to submit short, practical articles for this department. The items should be original and should relate to ways and means of handling production and maintenance jobs. Where possible, articles should be illustrated. Rough sketches only are required. Payment will be made for acceptable items upon publication.

Drum Reeving Simplified

There is a rule, a rather complicated one, that tells at which drum flange to start roping a smooth drum If started at the proper flange the rope will wind with the wraps tightly hugging each other. It will so wind itself on the drum that there will be no space between wraps into which a wrap from the layer above might squeeze and cause serious scrubbing, scarfing or binding. If a rope is not to damage itself prematurely the wraps must lie close together.

To reduce the tendency for rope to spool unevenly, many users are employing the preformed type, since in the manufacture of this type of rope practically all internal torsional stresses are eliminated. One result of "preforming" is to make the rope resist rotating when passing over drums and sheaves as is common with non-preformed. This resistance to rotating, whipping, together with its freedom from "crankiness" permits preformed rope to spool much better. However, regardless of the type of rope *used*, all ropes should be properly started on the drum. Here's the rule:

When a right-lay rope is being underwound on the drum (which is to say, it leads from the bottom of the drum) start it from the right flange, looking at the drum from the rear. If a left lay rope, start it from the left flange. Conversely, if a right-lay rope is being overwound (that is, it leads from the top of the drum) start it from the left flange. If a left lay rope (overwound) start it from the right flange.

That's a complicated rule to remember, and more frequently than not quick reference to it is not available at the machine. So—here's a far simpler rule—using your doubled-up fist to represent the drum, and the index finger to indicate the flange. With right-lay rope use the right fist. With left lay rope use the left fist. For overwound rope keep your fist back up. For underwound rope, palm up. Pointed to the drum the index finger will indicate both how the rope should lead from the drum and from which flange. The accompanying illustrations show how easily this rule may be applied.—R. B. WILLIAMS.

◆

How to Clean Motors

A systematic and periodic cleaning of motors is necessary to insure best operation. Most motors are located where some sort of dirt accumulates in the windings.

Some dusts are highly conductive, and lessen creepage distances. Other dusts are highly abrasive and actually cut the insulation when carried through by the ventilating air. Fine cast-iron dust quickly penetrates most insulating materials.

If conditions are severe, open motors might require some cleaning each day. For less severe conditions, weekly inspection and partial cleaning are desirable.

For the weekly cleaning, the motor should be blown out with dry, compressed air (about 25 to 30 lb. per sq. in. pressure). Where conducting and abrasive dusts are present, even lower pressure may be necessary, and suction is to be preferred since damage can easily be caused by blowing the dust and metal chips into the insulation. On larger d-c. machines, the air ducts should be blown out so that the ventilating air can pass through as intended.

The heavy dirt and grease should first be removed with a heavy, stiff brush, wooden or fiber scrapers, and cloths. Rifle-cleaning brushes can be used in the air ducts. Dry dust and dirt may be blown off, using dry compressed air at moderate pressure. Direct the air so that dust will not be pocketed in corners.

Grease, oil and sticky dirt are easily removed by applying cleaning liquids such as carbon tetrachloride, gasoline, or naphtha. There are several good methods of applying the cleansing liquid. Probably the best method is to spray it on. Care must be taken not to soak the insulation by dipping coils or small motors into the liquid.

The insulation will dry quickly at ordinary room temperature after cleaning, but it is highly desirable to heat it to drive off all moisture before applying varnish. If the motor can be spared from service long enough, the insulation should be dried out by heating to from 90 to 100 C. (195 to 212 Fahr.).

While the motor is warm, a high-grade insulating varnish should be applied. For severe acid, alkali, or moisture conditions where oil or dusts are present, special varnishes can be supplied.

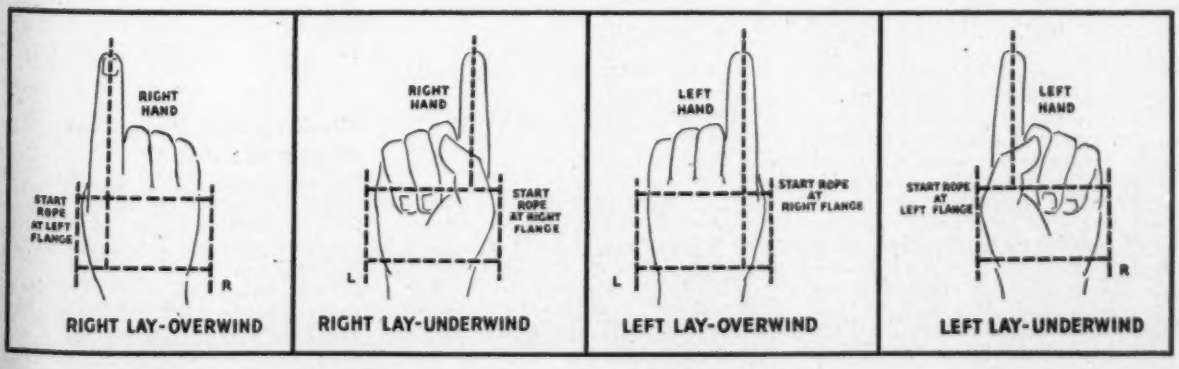
The varnish may be sprayed or brushed on. For small stators or rotors, it is best to dip the windings into the varnish, cleaning off the adjacent metal parts afterwards with a solvent. After applying the varnish, the best results are obtained by baking for the length of time recommended by the varnish manufacturer, often from 3 to 7 hours at about 100 C.

If the machine must be put back in service quickly, or if facilities are not available for baking, fairly good results will be obtained by applying one of the quick-drying black or clear varnishes which dry in a few hours at ordinary room temperatures.—GENERAL ELECTRIC COMPANY.

◆

Safety Program

Any safety organization to be successful should have something going on at all times to stimulate interest. We not only make use of some forty or more glass-covered bulletin boards all very neatly arranged; but, in addition, we conduct a departmental safety contest, and an interplant contest with our various mill organizations throughout the country. At the same time, we are entered in the Annual



Paper Industry Contest sponsored by the National Safety Council.

Once a year, at the end of the National Safety Council contest, after ratings have been announced, we hold a general mass safety meeting of all employees, including management. At this meeting, gold buttons are distributed to those employees who have completed five, ten, fifteen, and twenty years of service respectively without a lost time accident. Likewise, at this same meeting, any awards received in the National Safety Council contest or in the mill and inter-plant contests are presented. ERNEST DUTCHER, SAFETY ENGINEER, The Flintkote Company (Pioneer Division).

◆

Suitability of Different Kinds of Fire Extinguishers

Effective first-aid fire fighting requires the use of a suitable extinguisher on each different class of fire. There are three classes of fire, each determined by what is burning; and for each class there are appropriate extinguishers.

Fires in ordinary combustible materials, such as wood, paper, textiles, rubbish, etc., are known as *Class A* fires. They are best put out with water, which has a cooling and quenching effect. Extinguishers which contain water or chemicals and water are the soda-acid, foam, pump tank, gas cartridge and loaded stream types.

Vaporizing liquid and carbon dioxide extinguishers also are effective for controlling small Class A fires, if the fires are not deep-seated and if there are no strong air currents to dissipate the vapor or gas.

Fires in flammable liquids, grease, etc., are known as *Class B* fires. Here a blanketing effect is essential, to cut off the oxygen supply. Suitable extinguishers are foam, vaporizing liquid, carbon dioxide, and loaded stream.

Fires in electrical equipment, *Class C* fires, require the use of extinguishants that will neither damage equipment nor convey an electrical charge along the hose stream to the operator. Vaporizing liquid and carbon dioxide extinguishers are suitable for use on fires of this class. However, in some cases, fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water is necessary. In such cases, the equipment should be made electrically dead before water or water solution is applied.

The Underwriters' Laboratories label on every approved fire extinguisher indicates the class or classes of fire for which that extinguisher is considered suitable and the number of such extinguishers considered necessary to comprise one unit of protection. Thus, a 2½-gallon foam extinguisher is designated "A-1; B-1," meaning that it is approved for use on both Class A and Class B fires, and that one such extinguisher is required to make one unit of protection. These units of protection are standards that have been established by Underwriters' Laboratories for convenience in measuring the relative fire protection afforded by different kinds and sizes of portable fire extinguishing appliances.

The number of units of protection required in any given location depends upon the relative severity of the incipient fire to be anticipated. The National Fire Protection Association recognizes three general classes of occupancies—light hazard, ordinary combustible and extra hazardous. A guide for determining the number of units of protection required for each class of occupancy has been worked out. For instance, a place where fires of average intensity may be anticipated should have units so located that a person will not have to travel more than 50 feet from any point to reach the nearest unit, but at least one unit will be required for each 2,500 square feet of floor area.

The inspection department having jurisdiction usually will determine the degree of hazard of a given occupancy. Further information is contained in a pamphlet entitled *First Aid Fire Appliances,* published by the National Board of Fire Underwriters, 85 John Street, New York, New York.—SAFETY RESEARCH INSTITUTE, INC.

◆

Valve Don'ts

Don't use a wrench on the hex on the far side of the joint. A twisted body may be the result.

Don't install a valve while it is in open position. The chance of twisting is lessened when it is in the closed position.

Don't install a valve so that it will carry the weight, sag or expansion of the line. Proper supports and expansion bends or joints should be provided.

Don't cut overlength threads on a pipe to be screwed into a valve. The pipe might shoulder against the valve seat and injure it beyond repair.

Don't apply grease or paint to the end threads of a valve. Put it on the pipe threads and it won't get on the valve seat to collect grit or scale.

Don't fail to blow out a new or altered line. Valve seats ruined by chips or dirt may be the penalty.

Don't use a long lever and a strong pull on a screwed joint. A short lever and a few taps with a hammer are more effective and won't twist the valve.

Don't try to reassemble a valve without full knowledge of its construction. Consult the catalogue and eliminate chances of ruining the valve or of costly shutdowns.

Don't try to reassemble a valve with disc and stem in the closed position. A scarred seat and a bent spindle may be the result.

Don't force a leaking valve. Usually the leak is due to foreign matter on the seat which may be cleared by opening the valve part way to flush.

Don't use gate valve or cocks for throttling. Globes and angles are the only kinds of valves for this purpose.

Don't install automatic stop and check valves in any but an upright position. For satisfactory operation the disc and piston must have a gravity drop.—*Reading-Pratt & Cady Division,* AMERICAN CHAIN & CABLE COMPANY, INC.

◆

Chain Belts—Slack and Alignment

The correct amount of slack (Figure 1) is essential to the proper operation of chain belts. Unlike other belts, chain belts should not be tight around the sprocket.

When chains are tight, the working parts carry a much heavier load than is necessary and work much harder than properly installed chains.

Figure 1

Too much slack is also harmful. On long centers particularly, too much slack will reduce life of both chain and sprocket, cause vibrations and chain whip.

Improper alignment of sprockets and shafts result in greatly increased sprocket and chain wear. To check alignment, remove the chain and place a straight edge against the sides of the sprocket teeth. Any misalignment will be quickly apparent. Wear on the inside of chain side bars and on the sides of sprocket teeth indicates misalignment. Remember sprockets and bearings must be securely fixed.

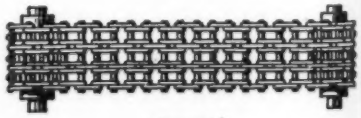


Figure 2

Sprockets not in line will cause excessive wear and early chain failure.

Shafts not parallel will have same results as misaligned sprockets.

Sprockets and shafts in correct alignment (Figure 2 assure chain life.—Bulletin No. 435, THE CHAIN BELT COMPANY.

◆

Cooling Hot Boxes on Paper Machine

Heavy-weighted presses, short belts, and absence of lubricant are the major causes of hot bearings on a paper machine. Infrequently a bearing may become so hot that its journal will glow.

A hot bearing will not hold its lubricant. If the lubricant is grease, it will melt as fast as added to the bearing; if oil, it will be spit out.

Roller bearings operated with insufficient lubricant over a period of time will stop and then will wear flat. If such bearings are provided with enough lubricant, this condition cannot develop.

Whatever the cause of a hot bearing, it is necessary to cool it. Water commonly is used as a coolant. Although the practice of directing a stream of water on a hot bearing is wrong, it is expedient.

Not all bearings permit ready inspection by the machine tender or oiler. Sometimes a hot bearing may be so located that water cannot be played on it.

Probably water will do no harm to a hot bearing if the bearing is not overly heated. However, bearing metal, when heated and cooled, has the tendency to become brittle or even to crack.

The only cure for a hot bearing is to correct the cause. If a belt is too tight, lengthen it. If a press is too heavily weighted, release part of the pressure. If a box does not fit the shaft or journal, scrape and fit it. If rollers of a roller bearing have become flat, take them out and install new rollers.—ARCHIE MCCAFFERY.

◆

Handling Flat Paper for Cutting

A tight grip is most important in handling large lifts. The size of the lift to be cut often depends upon how much can be grasped at one time and put into place in good order. Sometimes, smaller lifts and more of them are more economical.

The time necessary to jog several lifts of heavy paper may be minutes more than to jog one large lift. The time required for the knife stroke is only a second. Good judgment, only, gained from experience, can determine the amount of paper fed to the machine for each cut.

In lifting, piles of large sheets should be folded over and raised to the table with care. The paper then will not sag against the grain and mar. Paper should be waved and rippled so that the sheets will not stick together when jogged into place. This eases the compression caused by the weight of the pile, permits the sheets to slide more easily.

When making several lifts of large sheets, a weight should be placed on top of the first so that the second will not pull the top sheets out of line when it is pushed against the gauge.

If the paper curls up at the back against the gauge, it will not make an accurate cut. It can be turned over so the top sheets are flat, or a weight may be put on top if the cut is of sufficient width that the weight will not interfere with the clamp.

When cutting more than one lift at a time, they must be the same weight so that the clamp pressure will be equal.

Paper is jogged against the gauge by pressing the ball of the thumb against the front of the lift from top to bottom. Paper should be jogged against the gauge before each cut. It should not be disturbed when it is turned for the next cut.

To cut a pile in half, fold top sheet in half and crease, then use the crease mark as a cutting guide.

When heavy paper is folded against the grain, the mark may not be true. In this case, it is surer to use an accurate rule and pencil marks.

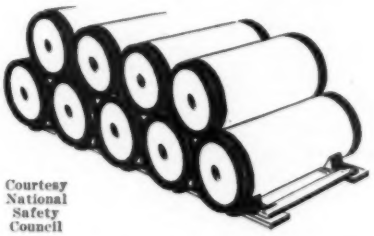
When cutting large sheets of paper, the air must be driven from between the sheets before the full clamp pressure is applied. Otherwise, the paper may slip out of register. This is easily done by drawing a weight across the paper. Then a gentle pressure of the clamp applied with the foot pedal will drive out additional air before the full clamp pressure is applied.—Paper Cutting, HENRY DISSTON & SONS, INC.

◆

Stacking Paper Rolls

When stacking rolls of paper, one of the hazards is the danger of a bottom roll slipping out and spreading the pile. Careful stacking and chocking of rolls will prevent this.

1. The bottom outside roll should be double-chocked, and the last chock should be nailed securely to a double row of 4x8 inch strips upon which these stacks are piled. Chocks should be of sufficient size to insure absolute stability of the piling.



Courtesy National Safety Council

2. To prevent the strips from spreading, join them at their ends by running another 4x8 inch strip across at right angles to the first strips and nailing their ends together securely.

3. Rolls of the same width should be piled together. A wide roll should never be stacked on a narrower one, because this tends to make the stack top-heavy.

4. Keep all butt rolls out of a stack of full rolls, because butt rolls tend to make a dangerous stack.

5. Allow adequate aisles for trucking, and adequate space for necessary movement between the rolls.

6. Keep all loose paper and all trash out of the aisles and from between the stacks.—*Safety Instruction Card No. 498*, NATIONAL SAFETY COUNCIL.

◆

Steam Trap Trouble Shooting

A steam trap, like any other mechanical device, may cease to function or fail to give satisfactory service.

Analysis of steam trap troubles will show that a very large percentage of them are in reality system troubles rather than bonafide trap troubles. Whenever a trap fails to operate and the reason is not readily apparent, the discharge from the trap should be observed. If the trap is installed with a test outlet, this will be a simple matter, otherwise it will be necessary to break the discharge connection.

If the trap fails to discharge condensate, check the following:

1. Pressure May Be Too High

a. Wrong pressure originally specified.

b. Pressure raised without changing valve orifice.

c. Pressure regulating valve out of order.

d. Pressure gauge on boiler reads too low.

2. No Water Coming to Trap

a. Trap installed above leaky bypass valve.

b. Broken or damaged siphon pipe in siphon drained dryer.

c. Broken valves in line to trap.

d. Pipe line or elbows plugged with dirt.

3. Bucket Vent Plugged

a. Caused by bad water conditions and usually can be prevented by installing a strainer ahead of trap.

4. Trap Body Filled with Dirt

a. Strainer will prevent accumulation of particles too large to be carried out with condensate.

5. Worn or Defective Mechanism

a. Examination will show which parts are worn or may otherwise require replacement.

If the trap discharges water continuously, check the following:

1. Trap Too Small

a. Larger traps or additional traps should be installed.

b. High pressure orifice may be used for a low pressure job. Install right size of orifice.

2. Abnormal Water Conditions

a. Boiler may foam or prime, throwing large quantities of water into steam lines. A separator should be installed or else the feedwater conditions remedied.

If the trap blows live steam, trouble may be due to any of the following causes:

1. Valve Fails to Seat

a. Piece of scale or pipe cutting lodged in orifice.

b. Worn seat.

2. Trap May Lose Its Prime

a. Usually due to sudden or frequent drops in steam pressure. On such jobs, the installation of a check valve is desirable and likewise the trap should be located well below the line or unit that it is draining.

If trap operates satisfactorily when discharging to atmosphere but trouble is encountered when connected with return line, check the following:

1. Back Pressure May Reduce Capacity of Trap

a. Return line too small.

b. Other traps may be blowing steam.

c. Vent in return line may be plugged.

d. Obstruction in return line.

2. High Vacuum in Return Line

a. Increases pressure differential beyond which the trap may operate. Remedy, install higher pressure trap.

When trap operates satisfactorily but units fail to heat properly.

1. One or More Units May Be Short-Circuiting and the Proper Remedy Is to Install a Trap on Each Unit.

2. Trap May Have Inadequate Air Handling Capacity.

a. A larger trap may be required or else the use of a thermic unit is advisable.

If it appears that steam escapes every time trap discharges, remember:

1. Hot Condensate Forms Flash Steam When Released to Lower Pressure

a. Flash steam usually condenses quickly in the return line.—ARMSTRONG MACHINE WORKS.

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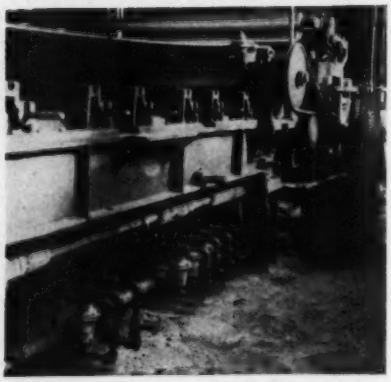

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Scandinavian Pulp and Paper Industries*

ERIC G. LAGERLOEF
Pulp and Paper Unit
Bureau of Foreign and Domestic Commerce

▶▶▶ IT WOULD SEEM that, in compensation for their remote northerly location, Norway, Sweden, and Finland, through their extensive forest areas, have been provided with very valuable economic resources. Some have called it "green gold," and, in truth, that is what these forest resources represent to these countries, for a considerable part of their populations depend upon this treasure for their subsistence. Because of this, the pre-war exploitation of these forests had been kept on the whole within the bounds of annual growth through extensive forestry practices.

In Norway, Sweden, and Finland, development of forest-products industries marked the first steps toward industrialization. From the small and comparatively crude industries of early days have grown some of the largest and most modern sawmills and pulp and paper mills to be found in the world today. On the whole, they manufacture the same products and operate in the same markets. It was, therefore, natural that there should have existed a certain competition between them, but, above all, they had common interests and a common goal. Co-operation between the Northern countries was thus perfectly natural, and became more essential as time went on.

Factors in Co-operation

In addition to many forms of economic co-operation in trade policy, shipping, customs, and communications between the three governments, there were the cartels formed by the woodworking industries in the middle thirties. The Sulphite Pulp Suppliers (SPS) and the Mechanical Pulp Suppliers (MPS) were formed to regulate production and sales and to stabilize prices through fixing export quotas on wood pulp of all types. The Scankraft, Scangrease-proof, and Cap cartels were formed by the paper industries to accomplish similar results on the principal classes of paper products. The newsprint and sulphate-paper trades also had their own associations or conventions.

Nevertheless, this economic co-operation between these three countries had its limits because each country was an independent nation. They did not form a single economic unit. Therefore co-operation was limited to the extent that it applied only where interests and advantages were common. And yet, this co-operative spirit was spontaneous and continuous in the past, and may well be the key to post-war industrial revitalization in all three countries.

After Nazi Collapse?

When the European phase of the war has come to an end, there may well be a very heavy demand for wood pulp and paper, greatly exceeding supplies. The liberated countries will be anxious to import the goods necessary for rehabilitation and to build a foundation for future trade. Of these commodities, wood and wood products will play an important part. If Sweden retains its neutrality it will probably have to carry a very heavy supply burden in the international lumber, cellulose, and paper-trade markets for some time, until Norway, Finland, and Continental manufacturing services begin to offer any appreciable quantities in the world markets.

World markets after the war and the resumption of Sweden's exports to the United States and Great Britain are subjects of great interest at the present time. Sweden's capacity for supplying the needs in the quality field has placed it in an enviable position in the past, particularly in strong kraft pulp. Questions concerning manufacture, transportation (Sweden has lost 225 vessels or about one-third of its total pre-war merchant marine), foreign exchange, import duties, and competitive markets will arise. A group of specialists representing diverse Swedish industries visited the United States, the first part of 1944, and it is very likely that one of the most important topics of discussion was the one pertaining to the pulp and paper industry.

Not Much Damage

Contrary to common belief, the forest resources of the Scandinavian countries taken as a whole have not been over-cut or generally destroyed during the war. The actual cut of timber in Sweden for lumber, pulp, and fuel wood has probably been less than half of pre-war drain. In Norway and Finland there has been more actual damage due to active war and greater demand for logs, lumber, and fuel wood to sustain the armies and for fortifications, but, even then, these factors have probably been offset by smaller cuttings in other areas in these countries. The German quotas for wood production in Norway have not been fulfilled by a good margin, and the actual cut for the country as a whole has been within new growth. Of course, intensive forestry practices, such as planting of seedlings and selective cutting, have probably prevailed to a much lesser degree than formerly, but the smaller aggregate felling of timber would more than offset this factor. It would thus appear that unless there is further active warfare in the Scandinavian countries the forest resources will be in good condition for use in the post-war period.

SWEDEN

The wealth of the Swedish forests might have remained untapped for some time if the conditions for cutting, transporting and working up of the timber had not been so exceptionally favorable. The most important factor is the natural network of waterways (20,400 miles of rivers suitable for floating logs), covering the entire forest region and making it accessible to exploitation even in the most distant parts. Sweden thus enjoyed many special benefits in this industry which gave the Kingdom a distinct advantage over its rivals.

Sweden is one of the most extensively

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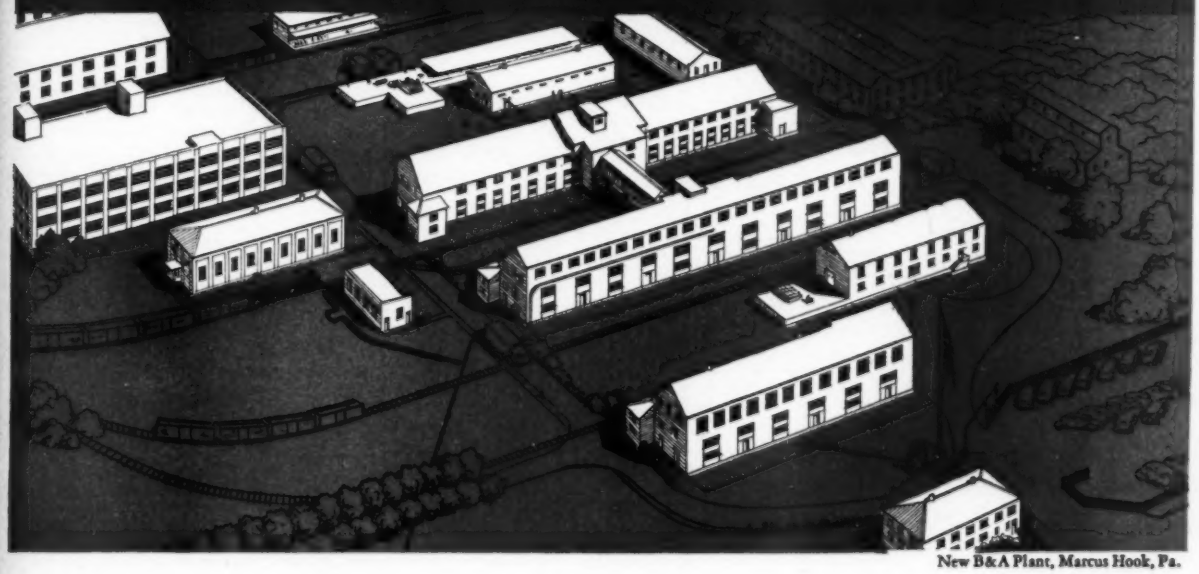

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forested countries in the world. Its forest area covers about 58,000,000 acres, or almost 60 per cent of the entire country. These forests consist of about 85 per cent pine and spruce, the former predominating, and from 10 to 15 per cent hardwood. This rich abundance of raw materials of high quality has raised Sweden to a position of dominant importance as a pulp- and paper-producing country, thus making this combined industry one of the most important factors in the economic life of the nation. The exceptional importance of the forests may be judged by the fact that industries based on forest products employed more than 25 per cent of the entire working population, while the value of forest-products exports accounted for nearly 50 per cent of the country's total export value.

Wood-Pulp Expansion

One of the most outstanding features of the economic development of Sweden during the past few decades has been the unusual expansion of the wood-pulp industry. This industry had grown in less than 50 years from an insignificant beginning into the second largest Swedish export industry. In the peak year of 1937, exports of pulp amounted to about 2,814,000 short tons, or 42 per cent of the total volume of the world's exports for chemical pulp and 31 per cent for mechanical pulp. In that year, Sweden occupied first place as an exporter of mechanical pulp, bleached and unbleached sulphite, and sulphate pulp.

The first mechanical pulp mill in Sweden was built in 1857. At the beginning of the seventies about 10 such mills were in operation. In the nineties, interest centered more and more on the chemical method of production, and the result was a period of prosperity for the cellulose mills. The sulphite-pulp industry secured the greater share of this success, but the sulphate mills also advanced rapidly because they were able to utilize sawmill refuse and low-grade timber.

The extraordinarily rapid development of the wood-pulp industry, temporarily interrupted when the after-effects of the First World War reduced production to less than 800,000 tons, can be judged by the fact that production had increased to over 2,750,000 tons in 1929, and to almost 3,900,000 tons in the peak year of 1937. The large volume of pulp intended for rayon and staple fiber produced by the Swedish mills was evidence of the high-quality product turned out.

In 1937, the bleached-sulphate production was 514,000 tons, of which 175,000 tons was rayon pulp, mainly for export. Because of the great demand for unbleached sulphate (kraft pulp) from the United States and Europe, production in this commodity almost trebled between 1928 and 1937 (474,000 tons to 1,158,000 tons). The United States was the largest user of Sweden's cellulose, imports almost doubling between 1928 and 1937 (601,900 tons to 1,130,075 tons).

Two organizations were founded about the turn of the century for the purpose of promoting and safeguarding the interests of the wood-pulp industry: namely, the Swedish Cellulose Association and the Swedish Wood-Pulp Association, the former representing the chemical pulp industry and the latter the mechanical.

Paper Industry's Development

The manufacture of paper in Sweden has been carried on for almost 400 years, rags being used as the primary raw material. Although the first paper machine in Sweden was set up as early as 1832, and mechanical wood pulp came into use in 1857, it was not until the eighties that a general transition took place at the more enterprising mills to an up-to-date production of paper, aided by the technical improvements of the time. Before the employment of wood pulp as a raw material, the Swedish paper industry produced almost exclusively for the home market. The paper industry expanded with the rise of the wood-pulp industry, and its position as a staple industry may be said to have begun early in the present century.

Sweden's paper production can be divided into three classes, namely manufacture of newsprint, wrapping papers, and fine papers, though there is a considerable manufacture of paperboard of all types. Newsprint and wrapping papers top Swedish paper production, representing about two-thirds of the total pre-war output. The prevalence of Swedish kraft pulp for wrapping paper and the abundant cheap water power for newsprint manufacture were decisive factors of consideration in manufacture, and, furthermore, these two types of paper could be sold with relative ease in the world markets because of the usually low customs duties in the various importing countries.

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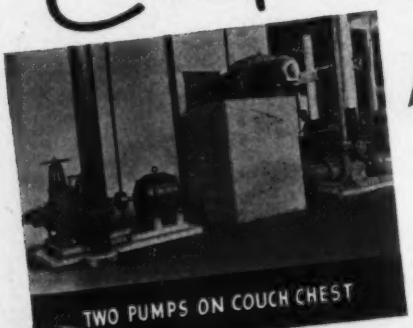

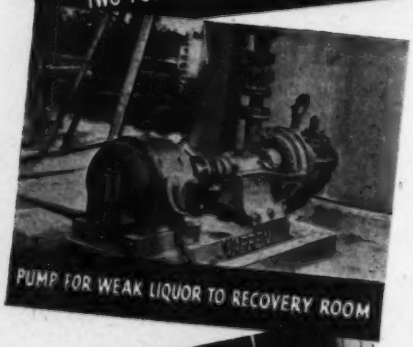

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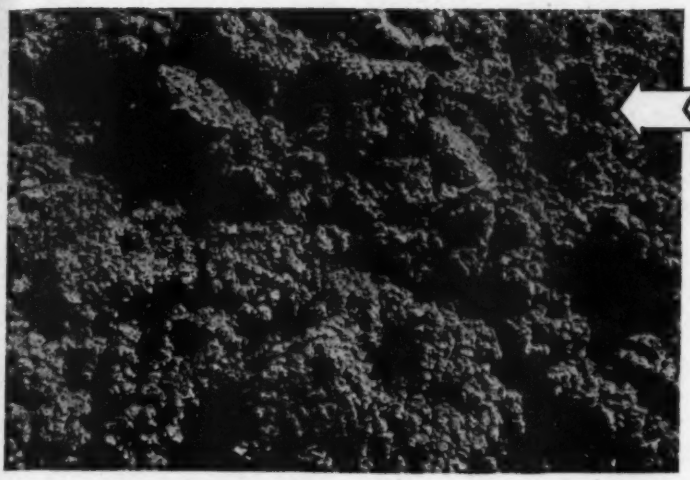

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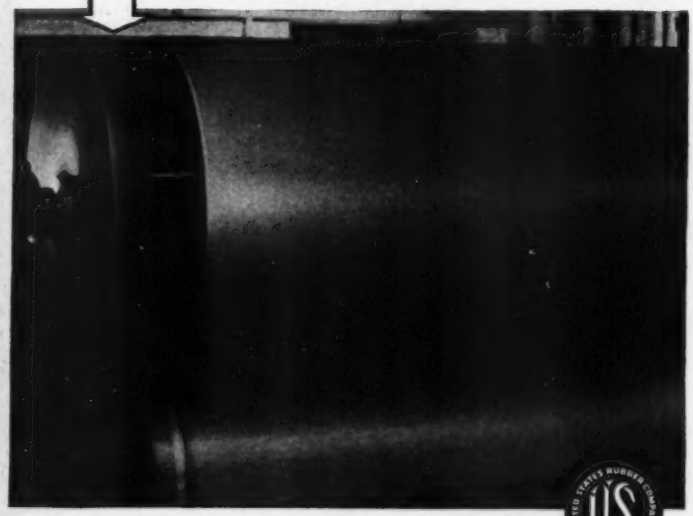

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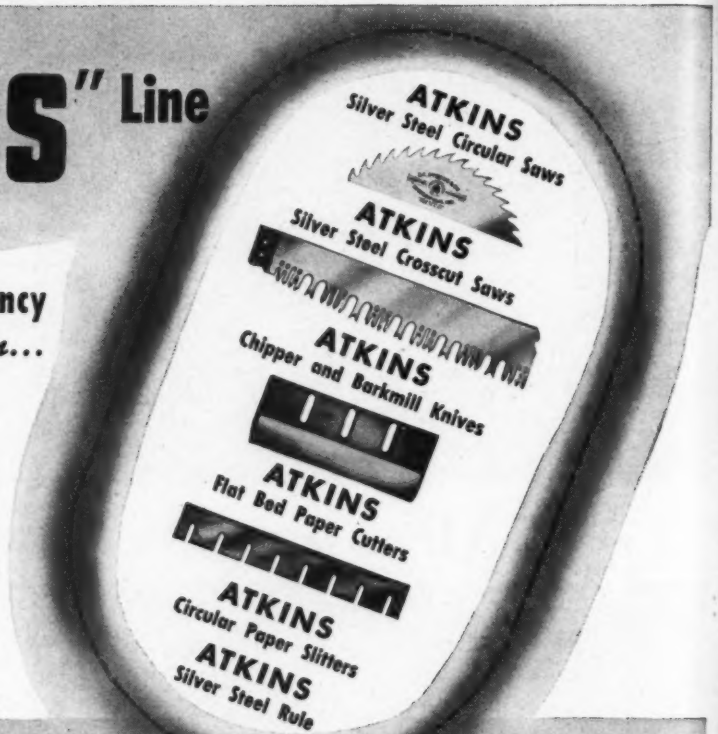

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CUTTING TOOLS WITH *The Edge that Lasts*

Import tariffs on paper and paperboard were also the main reason for the fact that export production of container board did not reach any great volume in Sweden. Instead, a container-board industry grew up in Europe, during the thirties, based chiefly on kraft pulp imported from Sweden.

To look after the joint interests of the paper industry, the Swedish Paper Mills Association was founded in Stockholm in 1898. It did valuable work in co-ordinating selling regulations in the paper industry, and in unifying price quotations for certain qualities of paper.

In 1939, there were about 96 pulp mills and 74 paper mills in Sweden. Three-fourths of the production of pulp was turned out in mills located in Norrland and the Provinces of Dalarna and Varmland, while the manufacture of paper was concentrated in the southern part of the country—the principal reasons for this being the ice conditions in the Baltic and the fact that the major portion of the domestic market for paper was found in the more densely settled regions of southern Sweden.

Present War's Impacts

During the weeks close after the outbreak of war in 1939, there was practically a suspension in export shipments. Blockade measures instituted by the warring powers completely isolated the Swedish pulp and paper industries from their most important export markets. About 70 per cent of the wood pulp and about 80 per cent of the paper exports had been going to countries cut off by the blockade. Sweden produced in pre-war years between 3,500,000 and 3,900,000 short tons of wood pulp and about 1,000,000 short tons of paper and paperboard. The exports of wood pulp and paper and paperboard during the last 5 pre-war years (1934-38) annually averaged 2,407,000 tons and 644,000 tons, respectively.

Contrary to general opinion, the Swedish pulp and paper industry witnessed a decline in production and export in 1943, as compared with 1942, returning to the levels of 1941. For the 10-month period of 1943, sulphite wood-pulp operating capacity was only 43 per cent of full production in comparison with 62 per cent in 1942, while sulphate total operation for 10 months of 1943 was 35 per cent of capacity in comparison with a like period in 1942 of 48 per cent. The 1941 estimates placed the sulphite and sulphate wood-pulp production percentage at 35, while the groundwood industry had operated at not more than 10 per cent of capacity during 1940, 1941, 1942, and possibly 1943.

Export Difficulties

Before the invasion of Norway in April 1940, Sweden shipped a large tonnage of wood pulp through that country because of mined waters off southern Sweden. Prices rose considerably in consequence of higher freight and insurance rates and higher production costs, which eventually necessitated many contract cancellations by the importing countries. As the war progressed and Norway was invaded, Sweden's wood-pulp exports sank from 1,088,500 tons in 1940 to 833,400 tons in 1941, and to 722,000 in 1942 (preliminary estimates). From January to March of 1943 wood-pulp exports were about 96,000 tons.

Paper and paperboard exports suffered a similar decline, from 663,300 tons in 1939 to 262,300 tons in 1942 (preliminary estimates).

From January to March 1943, about 50,000 tons of paper and board were exported. The export from June 1940 on was primarily restricted to shipments to or via Germany. Through the medium of trade agreements, Sweden was gradually enabled to make small shipments of wood pulp to Germany, Italy, and the rest of Europe. As this developed a greater tonnage of rayon pulp was shipped to Germany and Italy. Under a global contract with Germany concluded in June 1940 Sweden could export 170,000 to 175,000 tons of bleached and unbleached sulphite and sulphate, and some rayon-grade pulp.

In June 1941 the German invasion of the Soviet Union brought exports to Europe to practically a standstill. Gradually, however, exports resumed, and during 1942, though hindered by payment and transportation difficulties, Sweden managed to keep its export channels with the Continent fairly clear.

Sharp Slackening

During 1943 exports to Europe slackened, since transactions on a compensation basis became more difficult. With no indication of an improvement and no likelihood of early exports to America or England, most of the mills, except for domestic production, will probably close down during the coming months. Some of the mills, whose mechanical set-up will permit, will

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	Subject to Allocation			Not Subject to Allocation		
	BENOWAX C	BENOWAX B	BENOWAX F***	BENOWAX L	BENOWAX P	BENOWAX Q
Gravity, Liquid State (A.P.I., Theor. corrected to 60°F.)	35	34.3	35	8.8		
Melting Point (A.S.T.M. D127-30°F.)	140-45	150-55	145-50	*157-63	153	135
Penetration (A.S.T.M. D5-25, 77°F. 100G, 5 Sec.)	35-40	15-20	50-60	30-35	141	34
Viscosity (S.U.V. at 210°F.)	60-70	76	60-70	**430	79	52
Color (N.P.A., melted state)	4 dilute	—	4 dilute		7-8	4
Color (solid state)	Brown	Light Brown	Brown	Black	Amber	Light Amber
Flash (O.C.°F.)	500	525	500	540	555	450
Neutralization No. (No. Mg KOH per gram)	.20	.02	.20	1.8	0.02	0.01
Carbon Residue, %	.15	.50	.15	3.5	0.13	0.08
Iodine No. (Mod. Hanus)	5.5	7.0	5.5		4.4	3.9
Specific Gravity (60° / 60° (Theor.) Liquid State)	.849	.853	.850	1.008	0.898	0.905

**350°F.

*Softening Point (A.S.T.M. D-36-26)

***Subject to allocation but in ample supply

Developed for the specific purpose of providing dependable resistance to moisture-vapor penetration in wrapping and cartoning materials, the various grades of BENOWAX are both low in cost and flexible even at low temperatures. Although not recommended as an exposed coating material for some purposes, BENOWAX when used as a laminating substance, effectively retards the transfer of moisture-vapor without impairing flexibility in any way.

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There are, however, other grades of BENOWAX . . . notably F, L, P and Q . . . that may be obtained for less essential uses. Accordingly, you may find that a BENOWAX will serve your purpose without modification. However, should they not meet your exact specifications, they may be used as extenders for the more critical micro-crystalline waxes. In this way, they can help you through these days of emergency replacements.

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RULE 1—Putting the Knife on the Wheel

YOUR KNIVES are made with a strip of high-grade tool steel, or Genuine High-Speed Steel, welded on a soft steel backing. It is this tool steel, or High-Speed Steel that makes the cutting edge, and it is ONLY this finer steel that is apt to overheat to a burning point. No care is needed to protect the backing. The care must be all concentrated on the cutting edge.

Fig. A. Proper Grinding on Periphery of Solid Wheel

Illustrations "A" and "B" show the proper way to put your knife in contact with the emery wheel. Note the tool (or High Speed) steel cutting edge is up where it contacts the wheel first and where the coolant directly contacts the cutting edge, eliminating the main cause of overheating. Also, in this position the debris from the cutting is carried past the soft steel backing where it can do no harm.

Fig B. Proper Grinding on the Side of Cup Wheel

RULE 2 Use Plenty of Good Coolant Applied at Proper Points

PLENTY of good coolant, in fact you cannot use too much. It is very easy to use too little. Therefore, be on the safe side by using PLENTY. Plenty of coolant directly on the tool (or High Speed) steel cutting edge means that you simply cannot burn it. Grinding burns cause cracks that break out. Plenty of coolant AT THE RIGHT POINT stops burns. Have the coolant running on the wheel before you start to grind.

RULE 3 Use a Medium Soft Wheel for Free Cutting

WE ADVOCATE a soft grinding wheel with medium grit. These wheels will wear away a bit faster than harder wheels. In fact, a wheel that does not wear away is not cutting well. The increased life of the properly ground knife many times offsets the slightly increased cost of wheel wear. See that the bearings are tight when you use a soft wheel. Dress your wheel often and prevent glazing that leads to overheating.

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★ MISCELLANEOUS SAW & KNIFE FITTING EQUIPMENT

probably run one machine or some portion of the plant. Several of the kraft mills are already shut down, and the industry is much concerned, particularly since the loss of its South American markets.

In the early part of 1943 a considerable business was done in the paper and cardboard market with Denmark, but this business has dwindled to a point where only a small amount of paper and cardboard will be utilized and that primarily for kraft-paper sacks.

To increase its exports in 1942 and 1943 negotiations were carried out with England and Germany for safe-conduct traffic for Swedish ships. Though there have been interruptions now and then, safe-conduct traffic was resumed January 10, 1944.

Home Consumption Mounts

In paper, Sweden's home consumption has increased greatly, through expanded use in twine, rope, mats, sacking, packing containers, and as a substitute for tablecloths, napkins, towels, sheets, pillow cases, bandages, and similar items. Inland deliveries of paper and board increased from 264,000 tons in 1938 to 360,000 tons in 1942. Up to September 1943, the home market for paper and cardboard had been relatively firm; home-market sales in July and August 1943 were even slightly larger than in the corresponding period of 1942. The fine-paper and kraft mills are still the busiest, though war events have made it difficult for the kraft-paper mills to complete the old contracts and to make new contracts in the export market.

New Uses Sought

To compensate for the loss of markets, Sweden has turned to research to find new uses for its pulp and utilize the products of the forest in the Swedish home market. Fabrication of rayon and other paper textiles has increased, and production of cattle fodder from cellulose increased from about 60,000 tons in 1940 to about 300,000 tons in 1941. Finally such a great demand arose for cellulose fodder that the production resources of the sulphite mills became insufficient. It proved possible then to produce cellulose fodder also out of sulphate pulp. A Government contract covering the period from June 1942 to May 1943 called for about 600,000 tons of fodder cellulose, one-half of sulphite pulp and one-half of sulphate pulp. (This contract was later revised down to about 375,000 tons.)

For many months during 1942, for instance, the cellulose fodder traffic required almost 4,000 railway cars daily. Since the war began, more than a million tons of fodder cellulose have been manufactured by the Swedish pulp industry, most of it for home consumption. During the poor harvest years of 1940 and 1941, it saved many thousands of Sweden's cattle; however, the utilization of wood pulp in the manufacture of fodder cellulose is considered strictly a wartime emergency measure, undertaken in the absence of a sufficient amount of natural feedstuffs.

Byproducts have assumed increasing importance for Swedish pulp mills, and in some cases mills have been kept running primarily to supply these materials, such as sulphite alcohol (in Sweden there are today about 33 plants producing an estimated 30,400,000 U. S. gallons), liquid rosin, and cellulose yeast.

Indeed, its byproducts now are considered as important to the industry economically as the cellulose itself. Large production in items essential to the textile industry, including artificial silks and cellulose wools, has helped to relieve a serious cloth shortage.

Faced with the probability of being unable to regain all their old markets after cessation of hostilities, the Swedish producers of wood products are investigating new uses for the utilization of Swedish woods. This problem is engaging the attention of the Swedish Government as well as of private interests.

Bleaching Plants Built

Eighteen sulphite mills and six sulphate mills have built bleaching plants, and one is now in course of construction. The building of these bleaching plants results from two things: first, a desire on the part of the industry to meet increased world demands for bleached pulp, as well as high grades of paper to be made in Sweden from such pulp, and, secondly, a provision in Sweden's tax laws making it possible for capital investments to be made in plant facility on a basis very economical to capital. The capacity of the bleaching plants is not currently being utilized, but Sweden has built the plants with an eye to the future post-war period. About $12,500,000 has been invested by

PLANNING?

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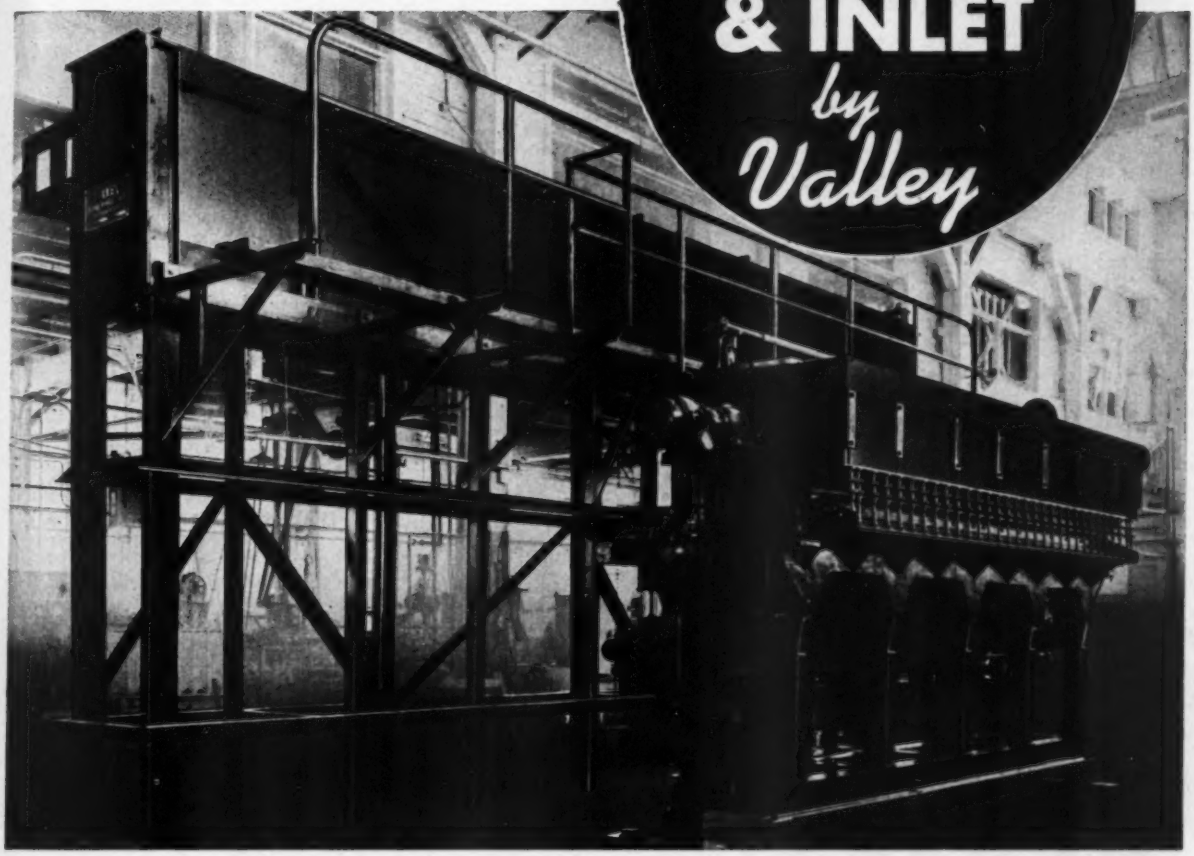

WE hear much these days about postwar planning. Most of this planning is important, vital. Some of it could better wait until the more serious task we have before us is finished.

But certainly industrial planning falls in a "must" category. Redistribution of manpower will be a challenging problem, and industry must be ready with a streamline program — the paper industry no exception. The postwar demand for paper will tax the mills of the country to peak capacity!

Will *your* equipment be able to take fullest advantage of this production opportunity? How about your inlets — pace-setters of paper output? While there's very little we can build for you now, we *can* help you *plan*. And a worked-out plan will represent much ground covered when the green light of peace is again turned on.

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the pulp and paper industry in Sweden in the past 2 years in bleaching plants, office buildings, laboratories, and the modernizing of buildings and equipment.

Situation Now

From information available, it can be briefly concluded that less than one-half of the total capacity of the paper and pulp plants in Sweden has been utilized for production during the past 3 years; that plant equipment and machinery in this field have not been run excessively, and are in excellent condition; that ample shutdown time (at least 50 percent) and necessary quantities of supplies and repair materials have been available; that many new buildings, bleaching plants, and laboratories have been constructed in the past 2 years; that Sweden's forests are in a healthy condition through selective cutting, even though a large quantity of wood for fuel has been needed because of the failure of Germany to deliver coal; and that a study of the price of shares of the Swedish pulp and paper companies in the markets indicates that public confidence in them is good.

Prices on the average have been well maintained; there has been very little variation in the price of pulp and paper during 1943, the price in December 1943 being approximately 300 Swedish crowns (U. S. $75) per ton. This price has been well maintained since 1939 when the price of pulp dropped to approximately 100 crowns (U. S. $25) per ton. Finally, in preparation for and anticipation of possible early shipments to former markets, at the end of 1943 there was on hand close to 500,000 tons of pulp, divided about evenly as to sulphite and sulphate wood pulp. This quantity is equivalent to only about 2 months' exports in 1937.

The war will have wrought many changes in Sweden's pre-war export markets, and the possibility of resuming exports to the United States on a former scale is very much in doubt, because of the increased new and efficient wood-pulp capacity in this country and Canada. Canada has increased its chemical pulp production to meet both United States and domestic needs; in fact both the United States and Canada, because of proximity to the expanding South American markets, may be able to retain a larger share of their pulp imports than in pre-war years. The British and Continental paper makers will in all probability turn to Sweden for a large percentage of the Swedish pulp exports.

FINLAND

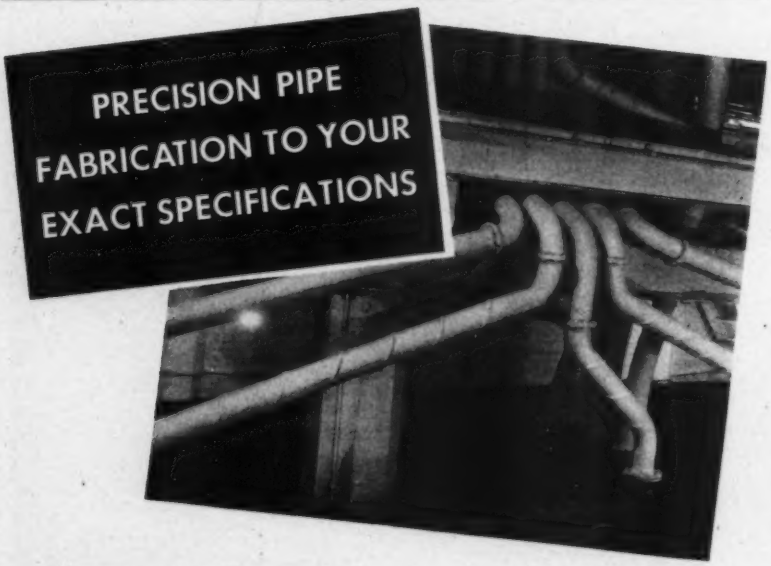
Owing to the relative scarcity of other natural resources, Finland, more than any other country, is dependent upon the forests for its livelihood. This is clearly apparent from the country's exports. Forestry has provided the foundation of the whole national economy of the country, and forest products have formed the most important part of Finland's exports, averaging 80 to 90 per cent of the total pre-war exports.

For its size, Finland has the largest forest resources of any European country. Of a total land area of 84,912,000 acres, 73.4 per cent is covered by forests, of which about 80 per cent is productive. The natural conditions of the country were favorable to industrial forestry enterprises in that the most suitable types of wood for high-grade converted wood products predominated, namely, 60 per cent pine, 28 per cent spruce, and 12 per cent birch and aspen woods.

Four Periods

Finland's pulp and paper industry went through four periods of development; 1870 to 1913; 1919 to 1927; 1927 to 1932; 1932 to 1937. In the first period, industries were developed steadily as the extension of railways opened new sections and water power was gradually utilized. At the end of 1913, production of chemical pulp amounted to about 250,200 short tons, paper and board production to about 249,700 short tons, while exports totaled 115,500 short tons and 161,900 short tons, respectively. Before the First World War the large Russian market was the principal outlet, but with the collapse of that market the plants had to be reorganized to meet the requirements of other European consumers.

When Finland became a republic in 1918, it faced a new future with resolve and determination to use its rich forest resources to obtain a place for itself in the world's wood-products trade. Three associations were formed in 1918 to safeguard the interests of the paper-making, cellulose-manufacturing, and mechanical-pulp, card-



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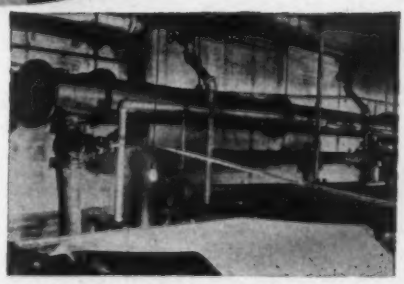
2 Because Monel resists corrosion by white waters and stocks . . . and, in addition, is strong and stiff . . . the sheet Monel used for the new line had to be *only half as thick* as the metal formerly used.

3 As a result of this satisfactory performance, Hammermill installed its *third* Monel stock line and receiver from hypochlorite bleached pulp washers to wet machines in 1939.

4 This line was readily fabricated and welded by the mill's own men, using 14-gauge sheet. The Monel welds were left "as-welded" since they do not require heat treatment or special processing to assure maintenance of corrosion resistance.



Twelve-inch diameter Monel stock line shown in upper photo feeds hypochlorite bleached pulp from the washer to the 10" diameter Monel receiver in wet machine room. The lines were fabricated and welded from .078" (14-gauge) Monel sheet in the mill's own shop.

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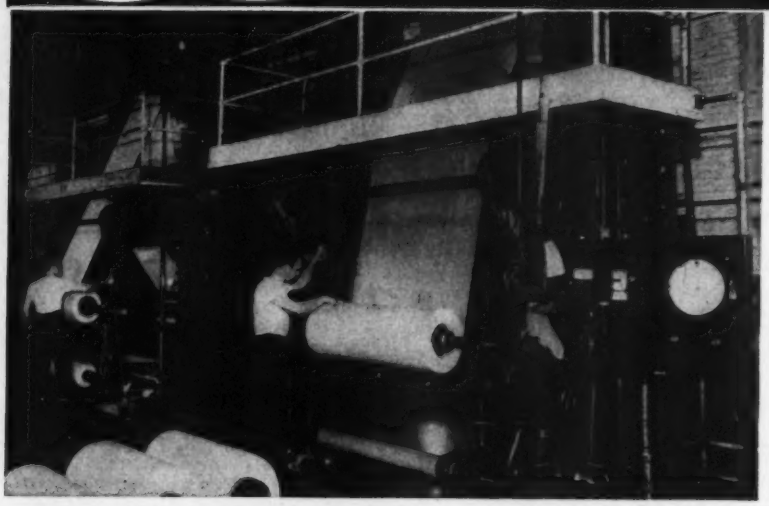

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board, and pasteboard industries, and to promote through joint action of sale of the members' products both in the country and abroad. These associations—the Finnish Paper Mill Association, the Finnish Cellulose Association, and the Finnish Woodpulp and Board Union—helped immeasurably to expand the home industries and to increase trade abroad through the establishment of representative agencies in large potential consumer countries.

That this foresight succeeded is evidenced by the tremendous expansion in the pulp and paper industries since 1918. In the production of the world's cellulose and pulp, Finland's share was about 10 per cent prior to this war, and the country occupied third place among the paper exporters of the world. From 1918 to 1927 production of pulp increased from 126,400 tons to 856,900 tons, while paper and board increased from 81,650 tons to 367,400 tons. Exports likewise reflected this great expansion, showing an increase from 84,000 tons to 513,400 tons of woodpulp and 26,500 tons to 290,600 tons in paper and board.

The third period of expansion (1927-32) showed an increase of more than 60 per cent in pulp manufacture and more than 20 per cent in paper and board. Exports in wood pulp had likewise increased to 100 per cent over 1927, and paper and board exports showed a rise of 45 per cent over 1927. Production of unbleached sulphite and unbleached kraft pulps registered a combined increase of over 70 per cent—more than 60 per cent of the total increase between 1927 and 1932. It was in this period that many more modern and larger pulp plants were erected.

It is in the fourth period of expansion, however, that the phenomenal increase in Finland's pulp and paper production can best be discerned. The year 1932 ushered in the latest era of development with new building activity and modernization of existing plants. In the time from 1932 to 1937, pulp production has increased almost 80 per cent from 1,392,000 tons in 1932 to 2,515,000 tons in 1937, while paper and board production increased almost 85 per cent, from 453,000 tons in 1932 to 844,000 tons in 1937. Exports increased commensurately, showing a 57-per cent increase in pulp and an 81-per cent increase in paper and board.

It is indeed remarkable that during this period, considering all the previous expansion since the last war, production should show its greatest increase in so short a span of years. The cellulose industry also expanded along new lines providing for the manufacture of various refined products such as rayon, artificial wool, cellophane, celluloid, cellulose lacquer, as well as manufacture of byproducts, such as sulphite alcohol, yeast, solid sulphate resin (pine oil), and soap.

War's Disruptions

With the outbreak of the European war in September of 1939, and the ensuing Russian War in November of that year, Finland started on a precipitous economic decline. Before its short but decisive struggle with Russia, Finland was the second largest exporter of chemical wood pulp in the world market, Sweden having attained first place. Finland's production facilities were to suffer greatly because of the Russian War, for the treaty with Russia in 1940 entailed the loss of approximately 25 per cent of its cellulose production capacity, 4 per cent of groundwood, 5 per cent of newsprint, and 24 per cent of paperboard capacity in the land ceded to the Soviet Union.

The loss of the Karelian Isthmus was a severe economic blow to Finland, but the country rallied and carried on despite the maelstrom of war elsewhere in Europe. Exports suffered immeasurably in 1940 as there was instituted a planned curtailment of exports. Imports and exports were possible only by special license. Bilateral trade agreements were made, nearly all based on the clearing principle. Export prices of pulp were up 25 per cent over 1939, paper slightly higher.

When German-Soviet hostilities began in June 1941, conditions for export were further complicated, in that Germany had virtual dictation over Finland's exports to the Continent, and consequently trade agreements and barter arrangements were set up to control the type and flow of materials between the two countries. General export trade with Germany increased to 51.1 per cent of the total in the first quarter of 1941. Exports of pulp and paper increased appreciably in 1941, mainly through trade agreements with Germany, after a 75 per cent decline in 1940.

Those New Dryer Stacks

Survey of Machinery and Equipment
To Be Installed In Pulp and Paper Mills In Post-War Period
List of Equipment
The replies from the pulp and paper companies on the check lists of the machinery and equipment units which the various companies plan to install after the war revealed that more than 150 different items will be purchased and installed in the first post-war year.
The machinery and equipment listed in order of replies received from the pulp and paper companies with the units which had the most check marks on the questionnaires listed first, and so on.
For illustration more mills are going to install dryers than any other piece of equipment, then comes boilers, and so on down the list.

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Factories which were removed from ceded areas to some extent in 1940 started work in 1941, and the unoccupied part of Finland showed an expansion of industry, partially compensating for the industries lost in the Karelian Isthmus. New products to be manufactured from wood were being investigated, and experimentation was carried out to locate new possibilities of production from the use of byproducts.

Picture Is Clouded

Conditions in the Finnish pulp and paper industry in 1942 and 1943 can be assumed to have shown some improvement, but little is definitely known of the actual picture. Paper and pulp production during the first quarter of 1943 was larger than in any quarter after the autumn of 1939. Cellulose production increased from 143,300 short tons to 176,400 short tons, and exports from 44,100 short tons to about 66,100 short tons in the first quarter of 1943. Mechanical groundwood production increased to about 13,200 short tons from practically a standstill, and nearly all of this production was exported. In this quarter, paper production also increased from about 55,100 short tons to about 99,200 short tons, while exports rose from 8,800 short tons to 49,600 short tons.

What the future of Finland's pulp and paper industry may be is difficult to determine, because so many vital factors are, of necessity matters of sheer conjecture at the present time.

NORWAY

Norway is by no means a small country in size, compared with many other European countries. The area of Norway proper is about 80,000,000 acres, while its Arctic dependency (Spitzbergen or Svalbard) is about 16,000,000 acres. The total area is, therefore, about equal to that of the State of California.

The forest areas of Norway are rather modest in size when compared with those of certain other countries, such as the United States, Sweden, and Finland. The forests of Norway cover 25 per cent of the total area alone, or approximately 18,000,000 acres, of which 52.7 per cent consists of spruce, 28 per cent of pine, and 19.3 per cent of hardwood. The preponderance of spruce, which is especially suitable for high-quality pulp and paper, gave Norway an advantage over many other countries. This fact partly explains why sulphite pulp and mechanical groundwood played such a dominant part, while the sulphate-pulp industry represented a rather unimportant proportion of the total output.

With a population of close to 3,000,000, Norway could not consume more than a fractional part of the chemical and mechanical pulp and paper it produced. These goods have, therefore, for many years, been among the most important articles for export and comprised a large percentage of the total exports. In 1937, this proportion equaled 24.3 per cent of the total exports, valued at 200,000,000 crowns (U. S. $50,000,000). The pulp and paper industries played a very important part in the commercial balance of the country.

Course of Evolution

The Norwegian wood-pulp industry got its start about 1870. The first mechanical pulp mill was established in 1868, to be followed soon after, in 1874, by a sulphate-pulp manufacturing mill. By 1891, the embryonic industry had grown and was producing 22,500 air-dry tons of sulphate pulp; it continued expanding until 1937, showing an over-all production of about 1,208,000 tons. At the turn of the century paper manufacture also began to progress, with a total production in 1903 of 60,000 tons, in 1913 of 210,000 tons, and in 1937 about 490,000 tons of paper, including board. Production and export figures for 1938 showed a large decrease over the preceding year, but in 1939 the figures indicated a better year generally.

Expansion in the pulp and paper industry increased yearly, until by 1939 there were about 130 paper or pulp companies in Norway, many of them owning several mills. A large number of these pulp-producing mills banded together to form the Norwegian Cellulose Association, which helped to centralize and direct the commercial and technical efforts of the industry.

It is quite natural that every country should have a special product of its own manufacture which had attained a wide recognition, and in the case of Norway, which enjoyed in the world a reputation for being very progressive in inventing and developing better methods of pulp

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and paper production, it was bleached sulphite rayon-grade pulp. In 1939, one-fourth of the world's supply of bleached sulphite rayon-grade pulp was furnished by the Borregard Co. alone, and altogether Norwegian firms that year furnished the world's rayon factories with one-third of their supply of rayon pulp.

Newsprint and Other Papers

Norway's paper mills produced a large variety of printing, writing, and other papers. In terms of quantity, newsprint constituted the most important part. In the years after 1929, the newsprint industry had experienced great difficulties on account of severe competition, combined with unremunerative prices. The output of the newsprint mills had therefore been, in general, below capacity, the bottom being reached in 1934, with a gradual ascending production in evidence since that year.

Norway's output of writing papers also showed continual growth from 1930 to 1938, with 1937 exports at 33,436 tons, indicating that the level of production had been well maintained. Wrapping paper, such as kraft, greaseproof, parchment, sulphite, machine glazed, and tissue were also increasingly exported over a period of years. Paperboard manufacture and export figures also reflected increased production and export volume.

The years 1932 and 1933 and in part 1934 were extremely difficult as regards foreign trade. Prices were down to a level unprofitable for all branches of the pulp and paper industry. Under these circumstances, the several major European producing countries attempted to improve conditions through an organized co-operation in regard to production and prices. Cartel agreements were the result of this mutual effort.

Nazis Shatter Pre-War Structure

Little is known of the pulp and paper industry of Norway since it was brought into the orbit of German economy in June 1940. That this vital industry probably has had to cut production drastically because of shortages of coal and other materials can readily be understood. Norwegian exports, under Germany's industrial set-up, have undoubtedly been to Germany and countries under German domination, as Norway's principal pre-war markets were either lost or are now controlled by the Germans.

Because of the occupation, now of almost 4 years' duration, and its inevitable effects upon the industry, it must be most difficult for the Norwegians, to try to keep some semblance of order in this all-important segment of the country's economy. By manipulating finances, the Germans have infiltrated into major industries and plundered the Bank of Norway by more than $500,000,000. In anticipation of what the future may hold, it is unofficially reported that the Germans have mined every building and factory of consequence, ready to blow them up to make the country's destruction complete before being forced out. Besides, the Germans are in the process of stripping Norway of its chief industries, halting industrial expansion, and striving to take away with them all available industrial equipment.

If the Germans are forced to capitulate and surrender, without having to fight again in Norway, it may be that enough will be left for salvage, to assemble a workable base for industry; if not, it is reasonable to assume that it would take some years after cessation of hostilities before Norway could resume its important place in the international pulp and paper trade.

Preliminary Offer of Alaska Pulptimber for Sale

▶▶▶ THE FOREST SERVICE, U. S. Department of Agriculture, has decided to block out a large pulptimber unit on the Tongass National Forest in southeastern Alaska for investigation by representatives of the pulp and paper industry who may desire to study at this time, the postwar economic possibilities for the industry in this new field.

Designation of a specific timber unit will enable interested parties to make a detailed examination on the ground of the quality and loggability of the timber that would be available. It also will provide a definite basis for discussion with the Forest Service on the conditions which are to apply to any offerings of Alaska pulptimber in the near future. The work of blocking out the unit will start at once and is expected to be finished by midsummer.

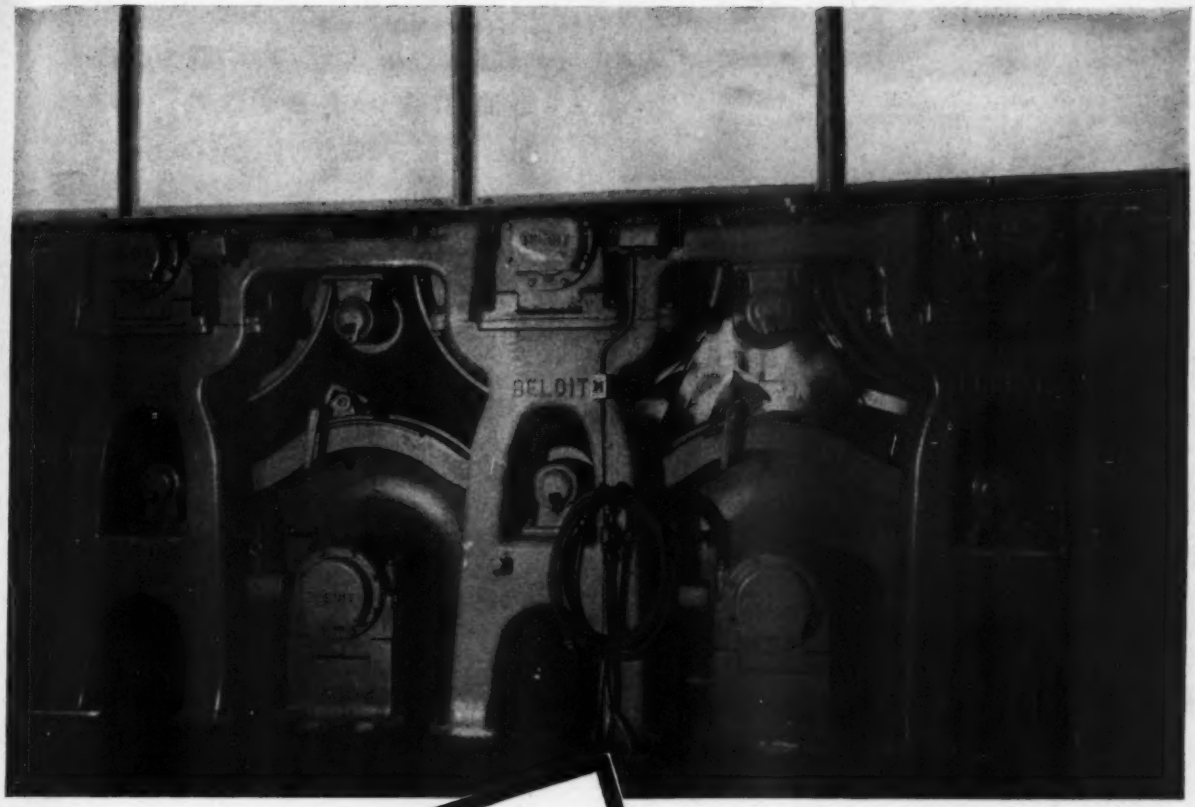
If responsible prospective operators, as a result of their investigations, desire to have the unit placed on sale, and if such action appears to the Forest Service to be in the public interest at that time, the unit will be offered for sale through advertisement calling for competitive sealed bids. Advertisement will not be started before December 1, 1944, in order to provide ample time for field investigation and later discussion.

Additional pulptimber units can be laid out in several sections of the Tongass National Forest if and when demand warrants.

Prospects for Regional Development of the Pulp and Paper Industry

The Tongass National Forest, in southeastern Alaska, is believed to present an opportunity for the development of a large, permanent pulp and paper manufacturing enterprise founded on a sustained supply of timber. The forests are composed almost entirely of pulping species, roughly 75 per cent hemlock, 20 per cent spruce and 5 per cent cedar. The industry would have cheap log transportation along protected sea channels between the woods and the mill, ocean shipping for outbound paper products, and inbound mill supplies, water power for mill operation and an equable climate that permits almost year-round logging and unhindered mill operation throughout the year.

In view of these favorable features, the



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plans of management for the timber resources of the Tongass National Forest are being drawn primarily to supply permanently the raw material for pulp and its products. The plans will provide that the wood be manufactured in Alaska, that economically sized and well-equipped plants be installed, and that operations be so conducted as to promote stabilized employment for woods and mill workers and the building up of thoroughly modern industrial communities.

Selection of Timber Unit

The unit to be laid out at this time will comprise a number of tracts located in the general vicinity of Ketchikan. Total volume of standing timber to be included will be an estimated 1,350,000,000 cubic feet, roughly equal to 1,350,000 cords of peeled wood or to 7,500,000,000 feet board measure. This volume is deemed sufficient for the needs of a sulphite or sulphate pulp mill with a capacity of 150 tons daily during the first 10 years of operation and 525 tons daily during the following 40 years. The expectation is that the sale contract will allow a cutting period of 50 years. The size of the unit as finally offered for sale may be reduced to fit the needs of a plant of smaller capacity at the request of an applicant, if such action appears desirable to the Forest Service; otherwise the purchaser must agree to meet the above specifications as to plant installation and enlargement.

To show definitely the character of the timber that will have to be cut during the early and more critical period of the new industry, the boundaries of those portions of the sale unit which are to be cut over in the first 25 years of operations will be designated at the time the sale unit as a whole is being selected. The remaining portions of the area under sale will be divided into actual logging areas currently, as cutting progresses during the last half of the sale period.

In laying out this timber sale unit, as well as other units in the future, the Forest Service will exclude those areas in southeastern Alaska on which scenic and recreational values are predominant. Along the heavily traveled narrow sea channels, and along roads and the shores of recreational lakes and streams, cutting will either be excluded entirely or permitted only under some form of selective logging which will prevent unsightly scars or openings in the timber cover. Logging will also not be allowed to interfere with the salmon spawning streams which help support the important salmon fishing industry of this region.

Timber Sale Policies and Procedures

Alaska pulptimber will be sold under the same general policies and type of timber sale agreement that long have been applied to large sales of timber from the National Forests in the United States, but with some modification to help meet the unusual requirements of large pulp enterprises in this relatively remote region. Further modifications are possible, before the terms of the sale agreement are approved, if shown to be necessary or in the public interest.

The stumpage, but not the land on which it stands, is to be offered for sale. Cutting by the purchaser will be done under conditions of sale which insure satisfactory clean-up of the timber found on the logging areas and the leaving of the cutover land in good shape for natural reproduction. Clear cutting with reservation of groups of trees for reseeding purposes is the method of cutting usually employed in Alaska, but if further study shows the practicability of some form of selective logging on certain sites, the latter method may be employed on such sites in the future. Due to the wet climate of the south Alaska Coast, fire is not an important hazard in connection with logging operations, but woods workers will be required to take such precautions as are necessary. The Forest Service will maintain representatives on the ground to insure compliance with the timber sale requirements.

Prior to any offer of the timber unit for sale, the timber will be appraised by the Forest Service and the sale advertisement will give these appraised rates as the lowest that will be considered in a bid. The unit will be awarded to the highest bidder who can make a satisfactory showing, financially and otherwise, of ability to meet the conditions of sale.

The stumpage rates named in the award will apply for a five-year initial period only, and will be subject to readjustment at the end of that period and at five-year intervals thereafter throughout the life of the sale agreement, to bring them into conformity with the then appraised current values of stumpage in the region.

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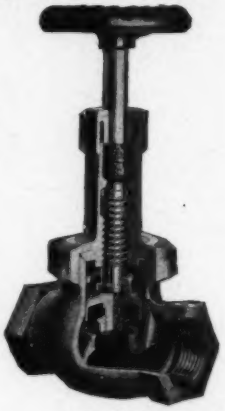

Fig. U01

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In fixing the appraised stumpage rates at which the timber will be advertised, consideration is to be given to the competitive position of the prospective Alaskan industry in relation to the existing pulp industry on Puget Sound and to the risks involved in the establishment of this enterprise in this new pulp-producing region. Likewise, the reappraisals which will be made throughout the life of the agreement as a basis for the periodic stumpage readjustments will give consideration to estimated Alaska costs for manufacturing and shipping as compared with such costs for similar enterprises on Puget Sound.

Alaska pulptimber is to be sold on the basis of a unit of 100 cubic feet of solid wood. This unit roughly corresponds to a cord of peeled wood. In this region timber can most easily be brought to the pulpmill as long lengths rather than in cordwood form, and the cubic foot is a simple, definite and logical measure for pulpwood in large long sticks. Pulp logs will be measured and paid for on their cubical contents, but larger spruce logs of the higher grades will be scaled and paid for as sawtimber. Timber of any species coming off the cutting areas, best suited for lumber or other purposes for which its value is higher than for pulp, and which is to be so used will be scaled in board feet and paid for at the sawtimber rates. Integrated utilization of the timber for the best possible products is desired. Timber of a special and higher value for some other purpose than pulp, and which in the public interest should be so utilized, (e.g. spruce aircraft material for national defense) must be made available or used by the purchaser for such product.

To make the local forest resources contribute in high degree to the support of the local population, the timber sale agreement will provide that logging and other crews for the purchaser's operations are to be recruited from among all residents of the region to the extent such laborers have the required skills and are available.

A surety performance bond of $50,000 must be provided by the purchaser.

Formal Notice of Sale

If decision is reached to offer this proposed pulptimber chance for sale the offer will take the form of advertisements in lumber and pulp trade journals of regional and national circulation and of legal notices in local papers in Alaska. The advertising period will be three months or longer. Sealed bids will be requested and a substantial deposit with bid, perhaps $100,000, will be required. The deposits of unsuccessful bidders will be returned. The deposit of the successful bidder will be retained as liquidated damages if the timber is awarded to him and he fails to execute the agreement, install the initial plant, or meet other requirements of the agreement within the periods specified; otherwise his deposit will be credited to stumpage payments.

General Information Relating to the Project

The Tongass National Forest, in which this timber unit is located, embraces approximately 16,000,000 acres and covers 73 per cent of the land area of southeastern Alaska. This section of the Territory comprises the long, narrow strip of mainland and the adjoining archipelago of hundreds of islands that extends southeasterly from the main body of Alaska for 350 miles along the west side of British Columbia. It is dissected by an intricate system of narrow navigable waterways which makes a large portion of the land area readily accessible. The climate, due to the influence of the warm Pacific current that reaches the northwest coast of North America, is similar to that of the Puget Sound region but somewhat cooler. Rainfall is extremely heavy, averaging 156 inches a year at Ketchikan and 81 inches at Juneau, 240 miles farther north.

Transportation to this region is by steamer from Seattle, Washington, and the principal ports of British Columbia. The steamship route follows the Inside Passage which lies back of the chain of islands, 1000 miles in length, that extends between Puget Sound and Skagway, Alaska. The distance from Seattle to Ketchikan is 660 nautical miles.

The population of southeastern Alaska in 1940 was 25,240, including 6,500 native Indians. Juneau and Ketchikan, the largest towns, had, respectively 5,700 and 4,700. Fishing is the principal industry, followed by lumbering and mining. Juneau and Ketchikan each have a modern, electrically driven sawmill of 100,000 board feet capacity for an eight-hour day. The pulp manufacturing industry has not yet been started

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in Alaska. *(A groundwood pulp mill of small capacity operated in Alaska some years ago, but has been non-existent for some time now.)*

The forest of southeastern Alaska is an extension northward of the coast type which occurs in the coastal (fog belt) sections of Oregon, Washington and British Columbia. In Alaska it is composed predominantly of western hemlock, with approximately 20 per cent of Sitka spruce and some cedar (western red and Alaska yellow) in mixture. There is no Douglas-fir in Alaska. Timber of commercial quality extends from the shores of the sea channels to an average altitudinal limit of approximately 1500 feet. Perhaps 75 per cent of the commercial timber volume lies within 2½ miles of tidewater. As a whole, the trees are not as large nor of as good quality as those of the same species in Oregon and Washington, and most of the timber appears to be primarily valuable for pulp.

Between four and five million acres of National Forest land are estimated to carry timber of present or possible future commercial value. The mature trees largely range from two and one-half to four feet in diameter, but spruce trees between four and six feet in diameter are not uncommon. The average volume per acre of stands classed as merchantable under present conditions is between 15,000 and 20,000 feet, board measure.

The total timber stand on the Tongass National Forest is estimated to be 78,500,000,000 feet B.M.

The Forest Service estimates that this Forest could supply 800,000 tons of sulphate or sulphite pulp, or substantially more than 1,000,000 tons of newsprint paper per year on a sustained yield basis, if its full possible timber output were to be used for pulp and paper manufacture.

Reconnaissance surveys have to date disclosed about 800,000 horsepower of potential water power, much of which can be developed in suitable units and at a reasonable cost for pulp and paper enterprises and other industrial uses.

Further information on the proposed pulptimber sale can be obtained from the Chief, Forest Service, U. S. Department of Agriculture, Washington, D. C., or the Regional Forester, Forest Service, Juneau, Alaska.

Convention Papers . . . Abridged

Projection Arrangement for the Determination of Fiber Dimensions

JOHN H. GRAFF[1], and JOHN R. FEAVEL[2]

Many different methods have been suggested and used for the determination of the fiber length of pulps. One method is to spread a relatively thin suspension of pulp fibers onto a microscope slide and estimate the length of the twisted and bent fibers under the microscope with a eyepiece micrometer scale. Another method is to place the slide or a glass dish with a thin suspension of fibers in a projection equipment and project the fibers at from 25 to 100 diameters onto a projection screen or paper; the length of the fibers may be measured directly by a mapmaker's curve or the fibers may be traced on a sheet of paper and the lengths determined by a map measure, a flexible ruler, or some similar method.

Both of these methods have serious drawbacks and the results obtained are more or less questionable. A much more accurate method is to prepare a suspension of a pulp with a density which will give about 25 fibers to the drop; using a dropper having an opening of 5 mm., one drop of this suspension is placed on the end of a number of slides. The slides are then dehydrated, two drops of iodine-iodide-calcium chloride stain are placed on the fibers and, after about two minutes, the excess is carefully removed. The saturated fibers are then straightened out with a dissecting needle under a dissecting microscope so that they are parallel with each other, covered with a cover glass, placed under the microscope, and the length and width measured with a filar micrometer, using a magnification of about 150 diameters.

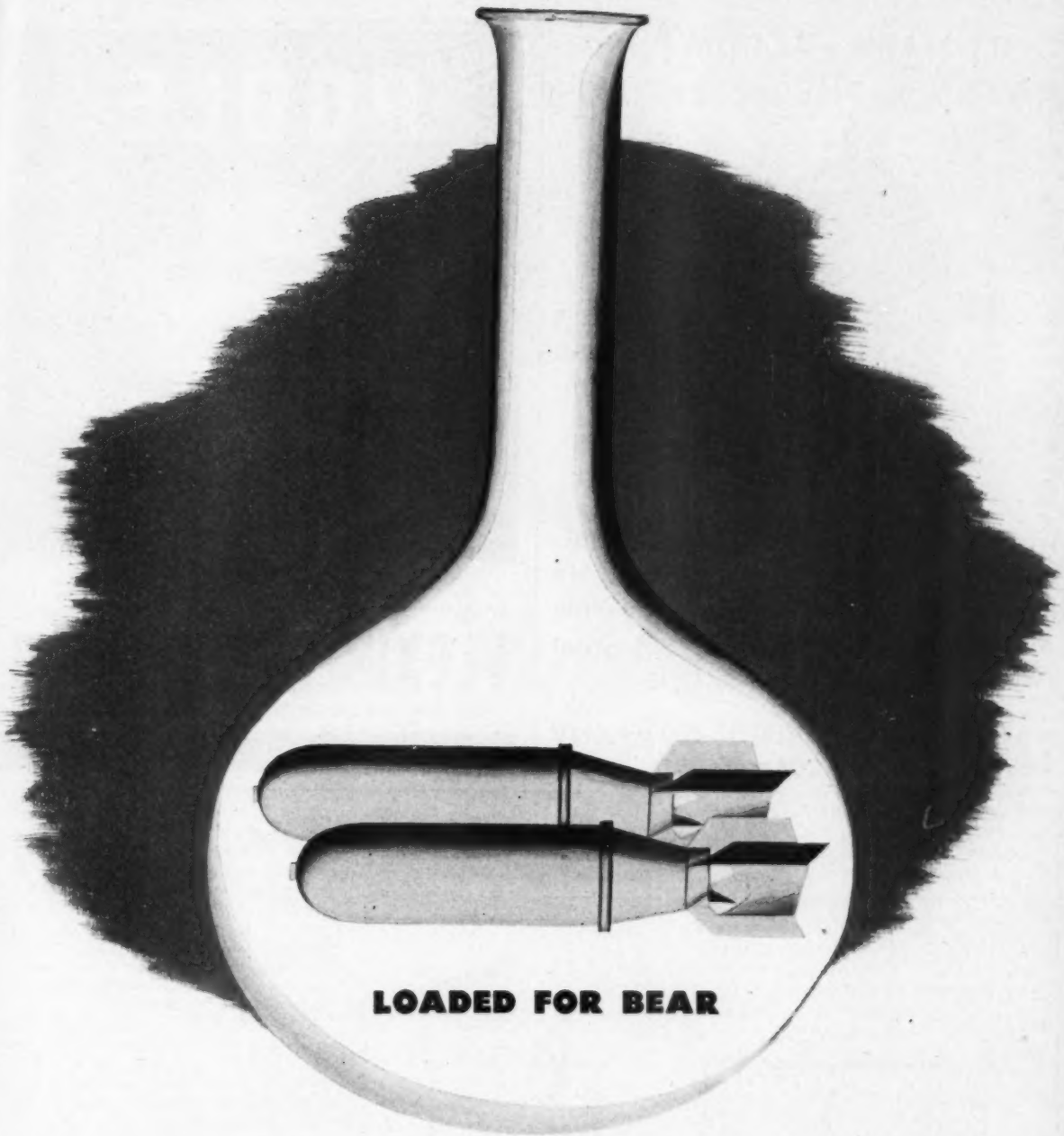
This method, although relatively accurate, takes considerable time, particularly in the measurements of long fibers and the measurement of fiber widths. However, the time could be considerably reduced if the slide with the straightened fibers was projected onto a graduate screen in such a way that all 25 fibers and the full length of the longest fiber could be observed at one time.

Figure 1 shows a sketch of such an arrangement. It consist of a projection microscope from which the microscope tube has been removed; in place of an objective, the microscope is equipped with an F 12.5 mm. f 2.8 projection lens. The microscope and illuminant are placed in a box-like table equipped with a reflecting mirror. The inside of the box is painted a dull black. On the top of the table-box and above the reflecting mirror is a ground glass (finely ground) on which a series of lines are drawn at 7.5 mm. intervals, representing the actual space between the lines of 0.1 mm. at 75 diameters magnification. Above the ground glass is a hood (the interior of which is painted dull black), which makes it possible to observe and read the dimensions of the projected fibers without disturbance from the light in the laboratory room.

At high humidity fibers stained with iodine-iodide-calcium chloride solution fade during the operation of being straightened out on the slide. Therefore, it is much better to stain the fibers in a beaker with the Bright stain described by Graff (A Color Atlas for Fiber Identification. Appleton, The Institute of Paper Chemistry, 1940), (Pulp and Paper Microscopy. Appleton, The Institute of Paper Chemistry,

(1) Research Associate, The Institute of Paper Chemistry; (2) Technical Assistant, The Institute of Paper Chemistry.

This is the third installment of abridgments of papers presented at the annual meeting of the **Technical Association of the Pulp and Paper Industry,** held in New York City, February 14-17, 1944. Monthly installments of these abridgments will appear in succeeding issues.



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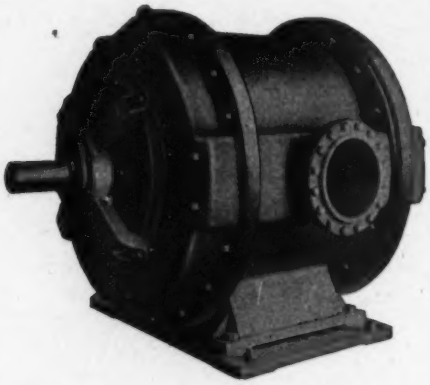

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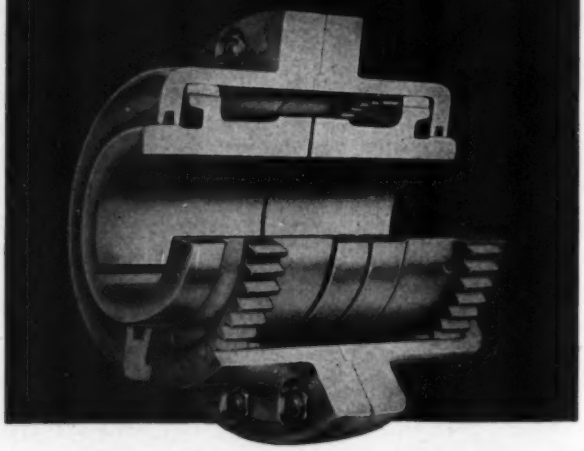

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1942), because this dyes both the unbleached and bleached fibers.

Thoroughly disintegrated pulp (1.5 grams) is squeezed dry between the fingers, placed in 50 cc. of a 1:1 mixture of Bright stain solutions A and B at room temperature, and stirred constantly for one minute. The pulp is then strained through a bolting cloth or nainsook, squeezed dry, and washed once with 500 cc. of distilled water in an Erlenmyer flask, strained, squeezed dry, put into 50 cc. of Bright stain solution C at room temperature, and stirred constantly for two minutes, strained, squeezed dry, and again washed in 500 cc. distilled water. The pulp is again strained and diluted so that one drop (using a dropper with 5-mm. inside opening) will contain about 25 fibers.

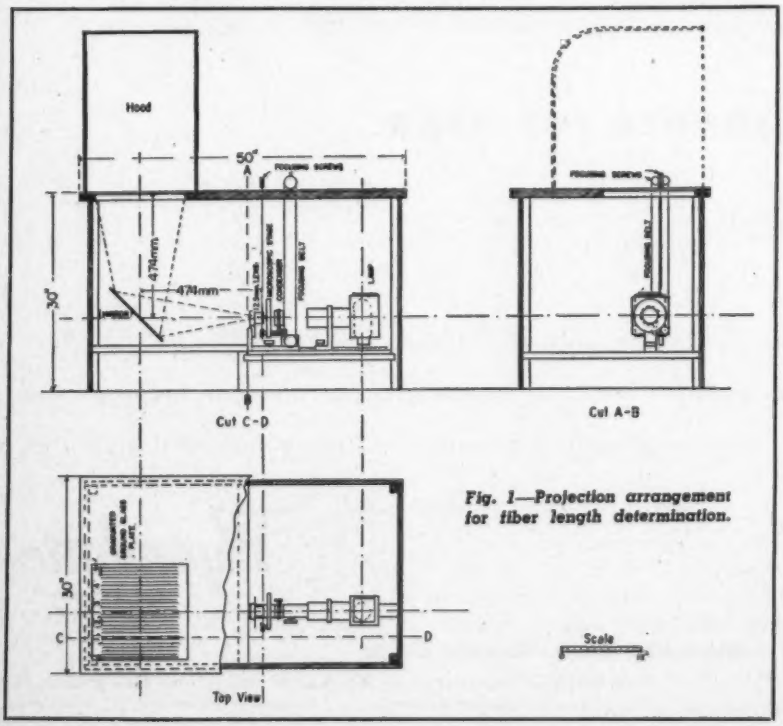

Fig. 1—Projection arrangement for fiber length determination.

This suspension is divided into four test tubes and two drops are taken from each tube, the tube being shaken well before each drop is taken. One drop is placed on the end of a standard microscope slide, making a total of eight slides. If the suspension is properly prepared, each drop should contain approximately 25 fibers.

These slides are then thoroughly dried at 50 C. in a drying chamber or on a hot plate. If the temperature is too high, the fibers will be cemented too strongly to the slide and may be broken during the straightening process.

After the fibers are dried, one drop of standard calcium chloride solution (1.36 specific gravity at 28 C.) is put on top of the fibers. After standing for about two minutes, the slide is carefully tilted toward the corner, the surplus chloride solution is examined for possible loose fibers (which must be teased back to the fiber mass), and the surplus chloride is removed with filter paper.

The slide is then clamped on a dissecting microscope and all the fibers are straightened out with a dissecting needle,

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and arranged side by side parallel to the length of the slide; a cover glass is placed over the fibers with one edge close to one end of the fibers. Calcium chloride is irrigated (from a small pipet) under the cover glass from the edge nearest the fiber ends.

The slide is then put on the stage of the projection microscope and projected on the ground glass under the hood. A transparent micrometer scale (mounted between two lantern slide cover glasses) placed on the top of the ground glass makes possible the determination of the length of each fiber to the nearest 0.1 mm. and also the estimation or direct measurement of the average width of each fiber to the nearest 0.01 mm.

At magnification of 75 diameters ray cells, fiber fragments, broken fibers, and whole fibers can be distinguished and it is possible to enter the length and width of the projected fibers directly.

A minimum of 200 measurements should be made; if the eight original slides are not sufficient, extra slides must be made. If 200 measurements are reached before a whole slide is finished, the rest of the fibers on that slide are measured and added to the others.

Special Processes for Coloring Paper

H. A. LIPS, Technical Laboratory, E. I. duPont de Nemours & Co., Inc.

During the last five years a few new processes have been adapted for paper coloring. These processes are not described in the literature, therefore, the application of "Naphthanils," sulphur colors, and vat colors to paper are described.

Naphthanils are a class of textile dyes that have recently been adapted to coloring paper. These colors belong in the class of colors that the dye manufacturer calls azoic colors, which are insoluble dyes that are chemically formed directly on and in the fiber. They are applied by coupling two dye intermediates directly on the fiber. The resulting colors are bright in shade, water insoluble, and have reasonably good light fastness normally associated with azo pigment types.

Naphthanils may be added either to the beater or applied on the surface. Surface application has the advantage of giving brighter, faster-to-light shades using less dye. A shade may be produced with naphthanils that is brighter than Crocein Scarlet and that will not bleed, since the dye is water insoluble. Crocein Scarlet, if wet, will bleed profusely.

Dyeing with naphthanils consists of two distinct operations:

A. Impregnating the stock with the naphthanil or coupling component to produce what is known as the "prepare."

B. Developing the color under controlled *p*H conditions by coupling the prepared material with diazo component to form the water insoluble dye directly on the fiber. This is illustrated as follows:

Diazo component (in solution) + Coupling component (in solution) = Pigment (water insoluble).

The naphthalin or coupling component itself is water insoluble and must be dissolved before using. The solution is best prepared by forming a paste with a small quantity of commercial alcohol and then adding sufficient caustic soda to form the sodium salt. The sodium salt is water soluble in the presence of excess alkali. It is always best to use soft water in dissolving the naphthanils but if it is necessary to use hard water, the addition of a good water softener such as Calgon is suggested. The naphthanil solution is reasonably stable but prolonged storage may cause the solution to lose strength. This will first be indicated by turbidity and later by the formation or settling out of a precipitate. The addition of a small quantity of formaldehyde usually improves the stability of the solution.

The diazo or developing component comes in two forms, either the free base or as a stabilized diazo salt prepared from an aromatic amine. The free base must be first diazotized before it can be used. By diazotizing the amino group of the base is converted into a diazo body which is reactive and will couple as soon as it is brought in contact with the prepare. This is done by reacting the base with acid and sodium nitrate under carefully controlled conditions.

The procedure is relatively simple, but

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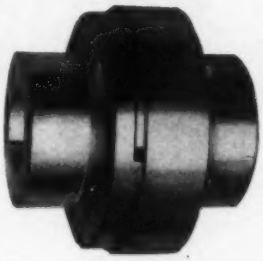

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requires care in following the chemical reaction.

The dye manufacturers have also developed a series of stabilized diazo salts. These diazo salts are equivalent to the corresponding bases and are usually standardized at 20 per cent of the strength of the base. In preparing these diazo salts, the base is diazotized and this reactive diazo is stabilized with certain salts. The diazo salts are marketed as dry powders and may be readily dissolved with cold water. These dissolved diazo salts are equivalent to a solution prepared by diazotizing the base. Neither of these solutions is very stable and they should be used as soon after preparing the solution as possible. Stability is a direct function of temperature although light and the presence of certain metals are also factors. The diazo solution should be kept as cold as possible and protected from bright light with the surface area of the solution exposed to the air kept at a minimum.

In surface applying these colors, it is necessary to use a two-step or two-roll coloring process. The naphthanil prepare should always be applied at the first roll. Sufficient wetting agent or penetrating assistant may be added to compensate for the speed of the machine. The desired quantity of prepare should be applied to the paper and allowed to soak in before the paper reaches the point where the diazo is applied. Coupling takes place almost immediately. Penetration is stressed because unless the prepare penetrates the sheet, the excess will follow the diazo applying roll and color will build up in the second bath. The two rolls may be as little as a few inches apart depending upon the speed of the machine. Coupling takes place very fast, producing maximum brightness. The alkalinity of the first bath may be counteracted by the acid buffers in the diazo bath so that the *p*H of the ultimate paper will not be changed appreciably.

These colors may be applied in the beater in a similar manner. That is to say, the prepare is added first, followed by the diazo. It is better to allow the prepare a short while to exhaust on the fiber before introducing the diazo.

Naphthanils have recently been used successfully for coloring twisting paper used in making the popular woven paper sack for packaging fruits and vegetables. The absolute fastness to bleeding and the good light fastness are distinct advantages over the old acid color combinations. They are adaptable for dyeing cover paper, display boards, twisting paper, fiber rugs and any paper that requires maximum color brightness with reasonably good light fastness and non-bleeding characteristics.

Sulphur colors as a group are an old and well-known class of colors which have always been in great demand by the textile industry and have but recently found a place in paper dyeing.

As a class, they are generally dull in shade, cheap in price, and are bleed and wash fast.

Sulphur color shades are ideally adapted for coloring kraft and unbleached fibers. They were first used for coloring paper soon after the turn of the century but their use has always been limited to special jobs. One of the principal objections to the use of sulphur colors in the paper industry was the evolution of hydrogen sulphide vapors and this gas was liberated when alum was added to the reduced color in the beater to neutralize the sodium sulphide used in reducing the dye. Recent improvements in dyeing with these colors using certain heavy metal salts to react with the liberated sodium sulphide have now completely overcome this obnoxious feature and no disagreeable vapors are evolved. However, mills that have copper lined beaters should not attempt dyeing with sulphur colors because of the black stain that would form on the copper due to the reaction between the sodium sulphide and the metal.

Sulphur colors dye paper fibers in a way similar to direct colors. They differ materially from the direct colors, however, in that they are best dissolved in alkaline solutions of sodium sulphide. The dye itself is insoluble in water; consequently to dissolve the color a definite quantity of commercial sodium sulphide is added to the dye and hot or boiling water is added to the mixture. The quantity of sodium sulphide required depends upon the dyestuff that is to be dissolved. The dye dissolves readily in this reducing solution. It is important to make sure that the dye is completely reduced so that the maximum

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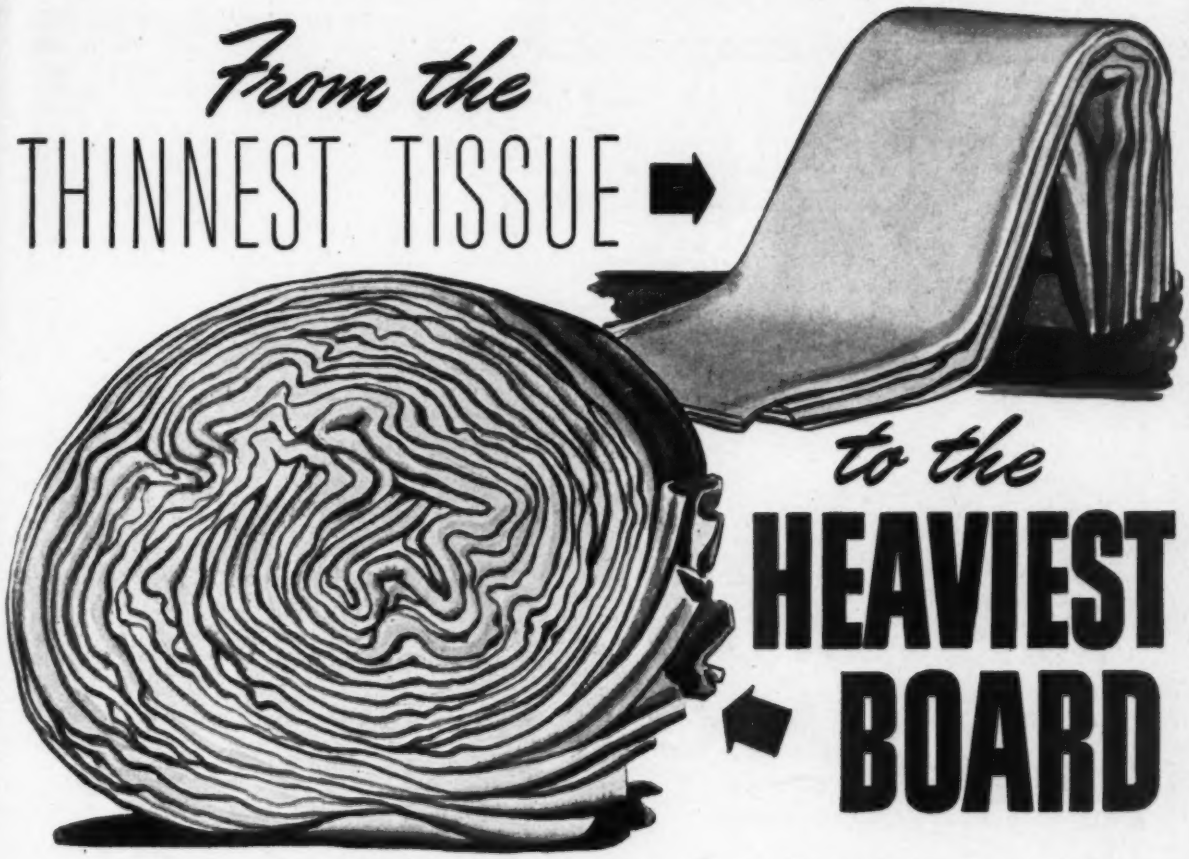

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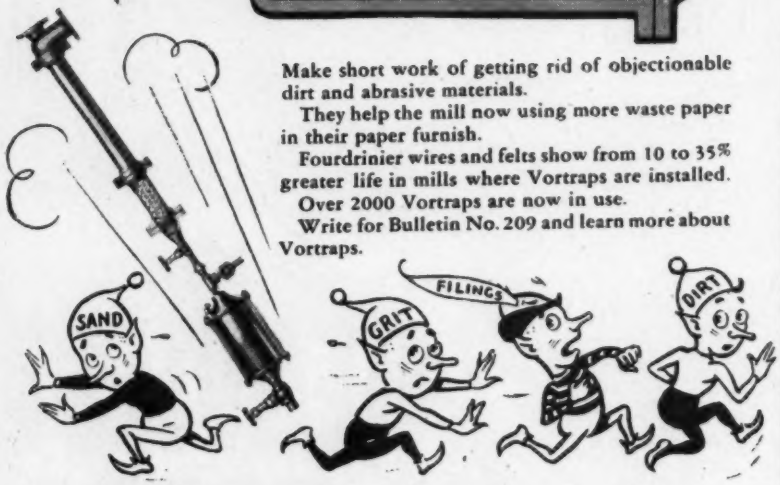

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color value may be realized. Before adding the dye to the beater a small quantity of sodium sulphide (approximately 5 pounds) should be added to the stock to remove any oxidizing influences present in the pulp. The desired quantity of color may then be added followed by 50 or 100 pounds of common salt to aid exhausting the color on the fiber when large quantities are used. The beater is preferably heated to 120 F. to develop the maximum color value. A few colors do not require salt, others do not require heat, information being available from the various dye manufacturers for each color. The color exhausts very rapidly on the fiber and less than 15 minutes are required for complete exhaustion. The beater is now quite alkaline due to the excess sodium sulphide present. The addition of a solution of certain heavy metal salts such as zinc chloride or copper sulphate at this point will precipitate the excess sodium sulphide as the metal sulphide and neutralize the high alkalinity and the *p*H will then be very close to the original *p*H of the stock slurry and the pulp may be sized normally. The small amount of metal sulphide retained in the sheet will have no effect on the sheet properties and only a slight effect on the color. Zinc chloride is ideal for this purpose. The white zinc sulphide formed will give a somewhat brighter shade than if copper sulphate or lead acetate are used. Approximately 1.2 pounds of commercial zinc chloride per pound of sodium sulphide present in the beater is recommended.

The color is now firmly attached to the paper fiber and cannot be washed off. The dyed fibers may now be used for graniting fibers or if a full shade is desired, the stock may now be sized with regular size and alum without further treatment.

In combination dyeing of sulphur colors together with acid, basic, or direct colors, the dye should always be added and exhausted first on the fiber. As soon as the metal salt has been added the other shading colors may be dyed on the fiber.

Sulphur colors aftertreated with copper sulphate are duller and usually somewhat faster to light than the zinc chloride aftertreated dyeings. A number of the colors will withstand a 100-hour Fade-Ometer exposure without serious fading. They are reasonably fast to acids and alkalies, but are relatively fugitive to chlorine bleach. They are ideal for coloring all heavy shades of browns or blacks. Twisting papers for fiber rugs and automobile seat covers are often dyed with these colors.

Vat colors are sold as water dispersible powders, pastes or grains. They are preferably dissolved in an alkaline reducing solution of sodium hydrosulphite. The reduced color is known as a leuco derivative. "Leucos" vary greatly in shade, for instance, the alkaline leuco of a khaki vat dye is red in shade and of a blue vat dye it may be yellow.

The paper industry has been using dispersed vat colors for tinting high grade papers for many years. These colors are considered permanent to light when applied on paper. There are a great many more vat dyes available than the few sold to the paper industry as tinting pigments. Although no paper mill has ever been known to have actually attempted to vat one of these colors on paper, a considerable amount of work has been done in the laboratory studying the application of these colors in paper dyeing. It was found that they can be vatted into the fiber to give bright, fast-to-light, and water insoluble shades.

The best method that has been found for applying these colors to paper is by adding a solution of the reduced vat to the pulp in the beater and allowing it to air oxidize into the fiber.

The beater should, however, first be heated to 140 F. and a small quantity of caustic and hydro added to counteract the oxidizing influences present in the beater. After adding the solution approximately 10 minutes are required before the leuco starts oxidizing into the fiber. The addition of some cold water to the beater at this time will aid materially in oxidizing the color. Sodium perborate and other oxidizing agents may be added, but tests show that no advantage is to be gained. As soon as the color is completely oxidized, sufficient acid, alum or niter cake should be added to counteract the excess alkalinity. The sheet may then be sized in the normal manner.

Vat dyes are not recommended for dyeing ordinary paper, but rather for special papers requiring maximum fastness. The very highest grade rag papers can be dyed with these colors to give color fastness properties equal to those of the paper itself. Waterleaf sheets made from high grade stocks beater dyed with vat colors make good bases for plastic impregnation. Plastics made from this type of paper have the necessary fastness required for many uses of plastics.

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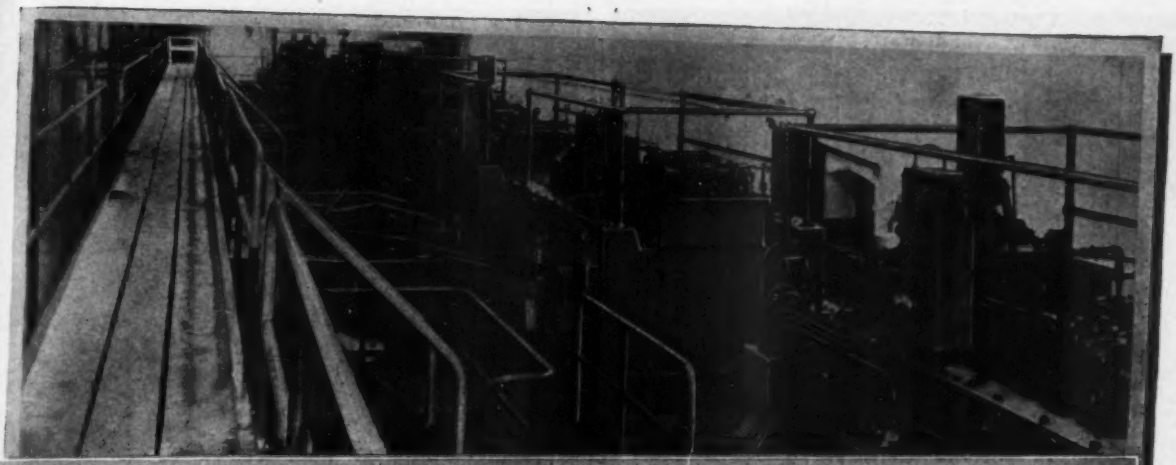

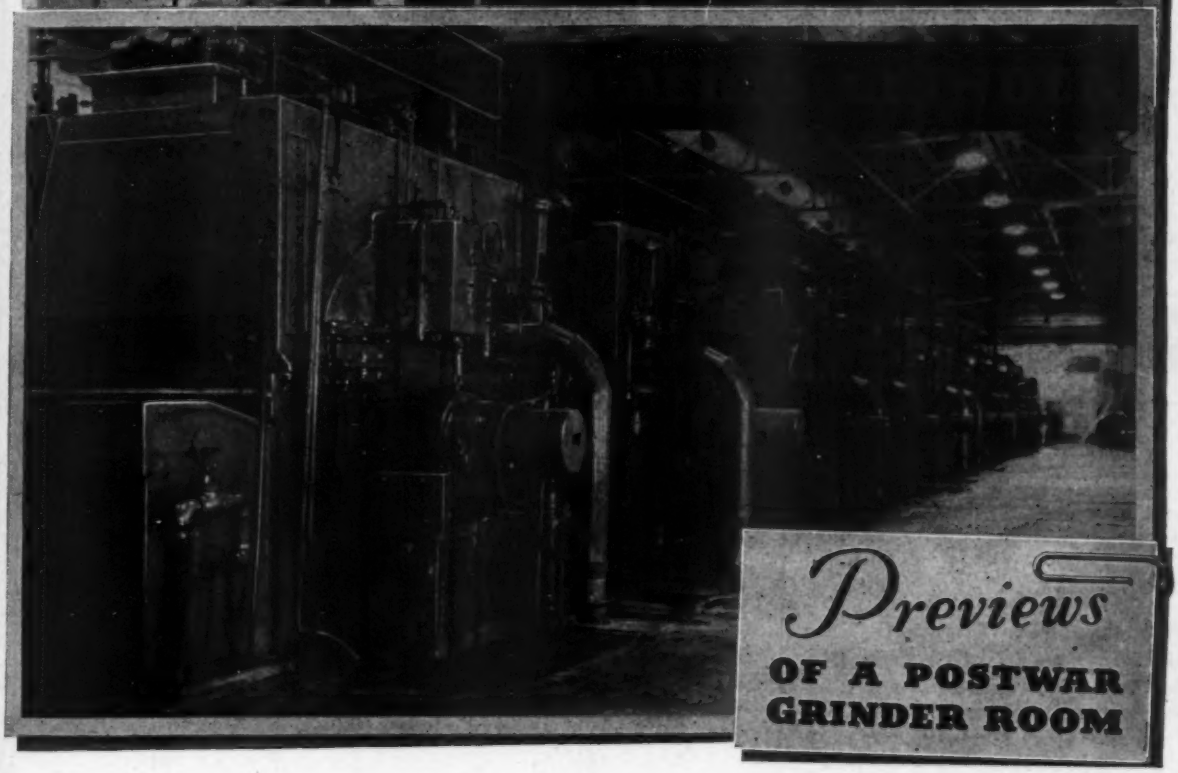

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These three coloring processes are new to the majority of paper mills. Each process can be used to fulfill a specific requirement and while the processes undoubtedly sound complicated, actually they are not. They are in every day use by the textile dyer and can be readily adapted to paper.

The Injection Pulping of Cottonwood with Conductometric Control*

SIDNEY D. WELLS[1], GEORGE E. MARTIN[2], and D. R. MOLTZAU[3]

The purpose of the present work was to investigate the control of injection pulping by means of the conductivity of the cooking liquor and to examine the pulps obtained from controlled injection cooks.

A conductometric instrument was planned which would permit measurement of the conductivity of the cooking liquor circulating through the digester system. Hardwood pulping with sodium hydroxide as the active chemical was chosen in order to have a simple system of ions in the cooking liquor.

The cottonwood employed in this study was furnished by the Arkansas Forestry Commission. This particular half-cord

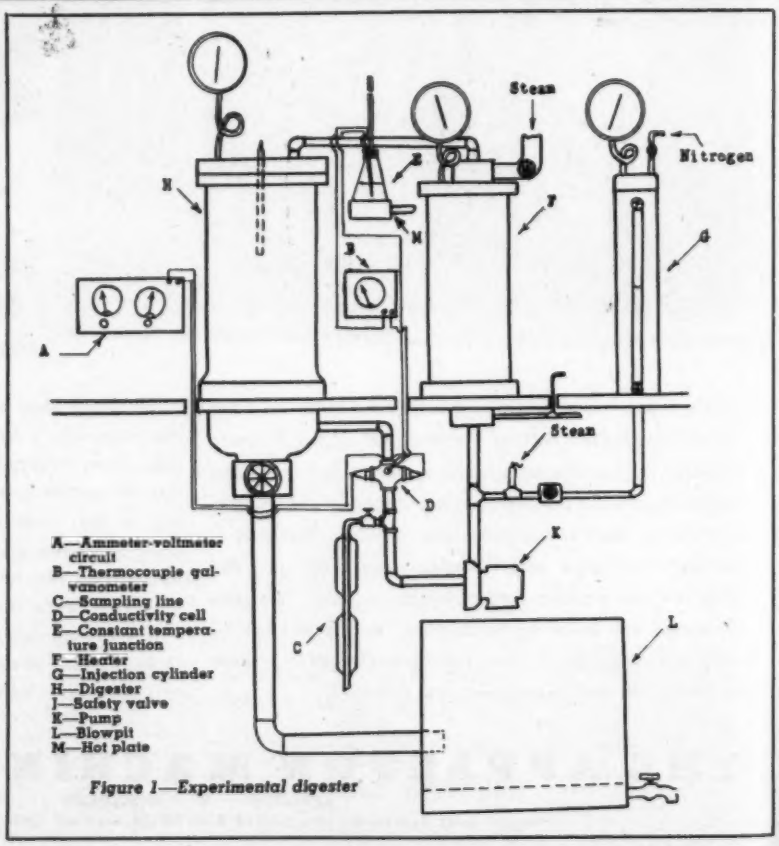

Figure 1—Experimental digester

(*) A portion of a thesis submitted by the junior author in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Master of Science from Lawrence College, Appleton, Wisconsin, May, 1943.

(1) Research Associate, The Institute of Paper Chemistry; (2) Student, The Institute of Paper Chemistry; (3) Research Assistant, The Institute of Paper Chemistry.

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was cut in Jefferson County, Arkansas, on October 7, 1942, from a pure stand of cottonwood grown on alluvial sandy loam soil. The wood was received at the Institute in the form of unbarked pulpwood sticks, about 4 feet in length.

The soda black liquor used in the development of a conductometric device was obtained from a cook which was not blown. At the end of the cook, the liquor was drained off through a condenser. The pulp was discarded.

A sketch of the digester with the control apparatus in its final form is given in Figure 1 and a wiring diagram of the conductometric circuit is shown in Figure 2.

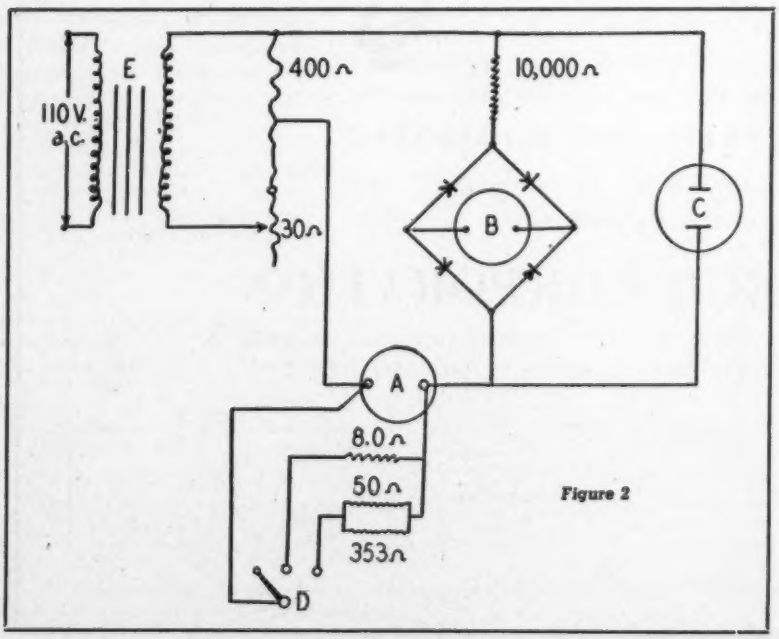

Figure 2

The wood was prepared, screened and made up into representative cooking charges in the usual manner. The cooking liquor was prepared from technical grade caustic (76 per cent sodium oxide) and tap water. Analyses of the liquor samples taken during the cook and of the pulps were made by standard methods.

It was found possible to incorporate in the circulating liquor line of the experimental digester a conductivity apparatus which would allow continuous evaluation of the sodium hydroxide concentration during the course of the cook. Sensitivity to changes in free hydroxide content was sufficient to permit the controlled injection of fresh chemical at such a rate that the amount of active chemical was held at practically a constant value.

The pulps produced by soda injection cooking with conductometric control were superior in strength to those prepared by standard soda cooks. Likewise, the injection pulps were lighter in color than the standard pulps.

With regard to commercial application, conductometric control has the very desirable feature of not requiring close control of the amount of chips charged into the digester or their moisture content. The concentration of the white liquor is not critical, although it would be quite critical if a predetermined injection schedule had to be followed. Permanent electrodes for the conductivity cell could probably be

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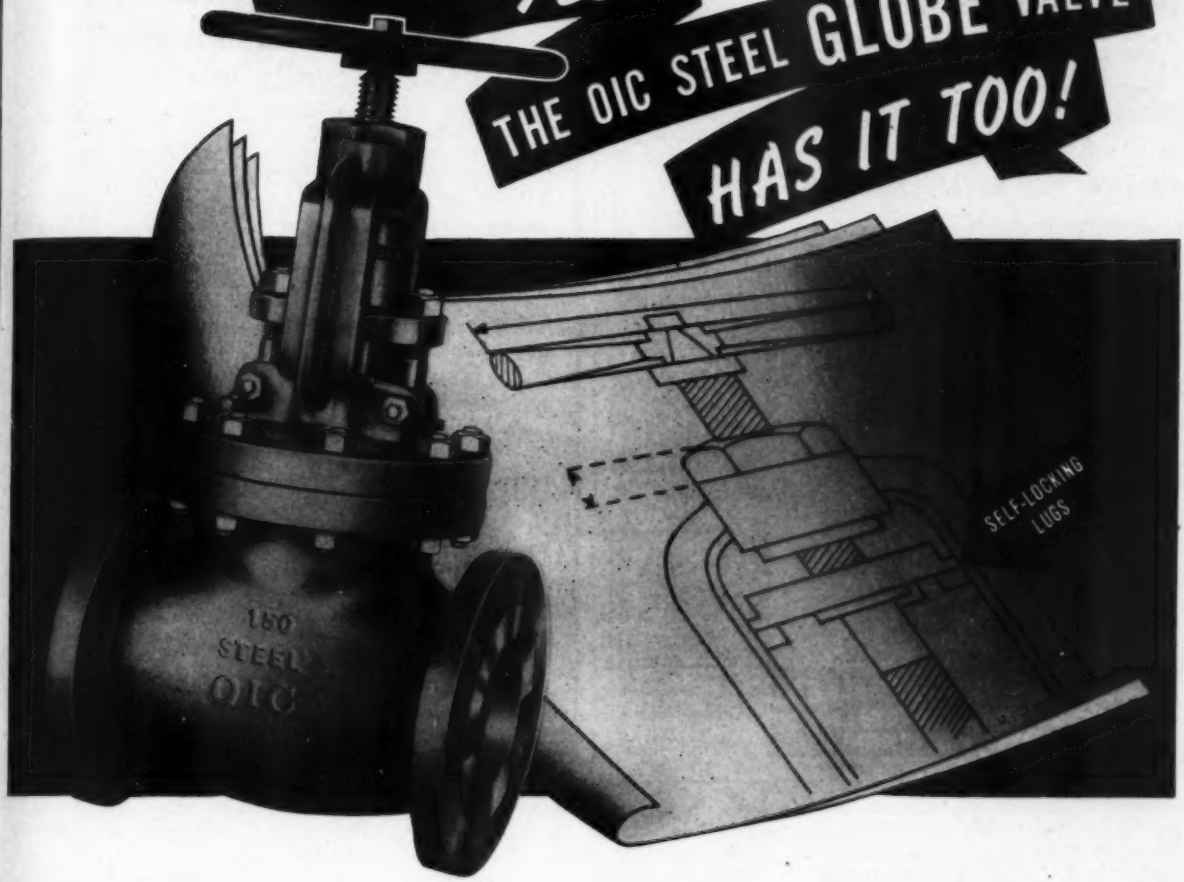

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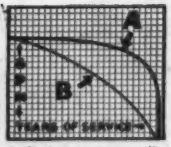

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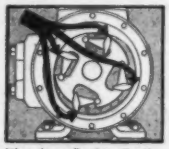

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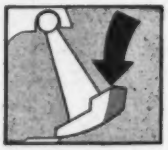

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constructed by an instrument company having the facilities for this type of work.

Steam pressure or a high-pressure centrifugal pump capable of withstanding caustic soda would be used in place of nitrogen for forcing the injection liquor into the circulating line. An additional tank would be required for the collection of the strong black liquor as it was washed from the pulp after blowing. This liquor would be employed for impregnation and would then be recovered in the usual manner. By means of this procedure, it is possible to utilize more completely the active alkali contained in the black liquor and thereby bring about a considerable saving in the amount of active alkali required.

The liquor circulation rate in the experimental digester gave a complete turnover of the liquor about every 2 minutes. This is rather high for commercial practice, although recent installations of kraft digesters (Foster, Pell W., *Tech. Assoc. Papers* 22:293-295, 1939) have been reported to give a complete liquor turnover in 5 minutes. The more rapid the circulation, the smaller would be the lag in conductometric control.

The Mechanism of Flow of Paper Stock in Pipes

JOHN L. GRAY[1] and
J. A. VAN DEN AKKER[2]

Complete knowledge of the processes involving the flow or movement of stock —the economic transportation of stock through pipes, the washing, screening, beating, and refining of stock, and the forming of the paper on the machine—requires an insight into the mechanism of such flow. This might well be termed the "hydraulics" of stock. If the flow properties of stock were similar to those of water, the problem would be simple. However, little of the hydraulic theory which has been developed for water will apply to stock.

The history of this problem shows that the general approach has been one of purely practical measurements of pressure drops in specific pipe setups, using a pulp with various consistencies at different velocities. The value of these measurements lies in their practical application to the design of pipe lines, but even this is questionable in view of the widespread discrepancies in the published results. The practical approach has failed to shed any light on the fundamental laws of friction in the flow of paper stock through pipes.

A new and more fundamental approach was studied by Baldwin and Van den Akker (*Paper Trade J.* 109, no. 12:31-36, September 21, 1939; *Tech. Assoc. Papers* 22:317-322, 126-130, 1939) and Delevanti (Unpublished work, The Institute of Paper Chemistry). Working with concentric cylinder apparatuses, most of the studies by Baldwin and Delevanti were concerned with the phenomena of surface friction at a stock-metal or stock-solid interface.

The work of Baldwin and Delevanti indicated that larger cylinders, larger space between cylinders, and direct measurement of torque required to drive the rotating cylinder were required. The purpose of the Master's thesis discussed in this report was to design and construct more adequate equipment and apply it to the further study of the surface effect on the flow properties of stock.

The general plan of design is to rotate a cylinder, 6 inches diameter, and 14 inches long, in a cylindrical container 1.5 feet in diameter holding stock up to a level which permits one foot of the rotating cylinder length to be submerged in the stock. The torque to the rotating cylinder is measured with a calibrated dynamic torque spring coupling between the rotating cylinder and the source of power. The power source is a variable speed, 0.5-hp. d-c. motor.

Using calibration charts for the torque spring coupling, resistance was measured in terms of torque, in units of pound-feet. the stock solid interface (Baldwin, P. C., to a depth of 11 inches, so that it would be possible, if desired, to calculate β', the frictional force acting upon unit area of the stock-solid interface (Baldwin, P. C., and Van den Akker, J. A., *Paper Trade J.* 109, no. 12:31-36, September 21, 1939; *Tech. Assoc. Papers* 22:317-322, 126-130, 1939). Since the area in contact with the stock was a constant value throughout the

(1) Student, The Institute of Paper Chemistry (B. F. Goodrich Co., Louisville, Ky.); (2) Research Associate, The Institute of Paper Chemistry.

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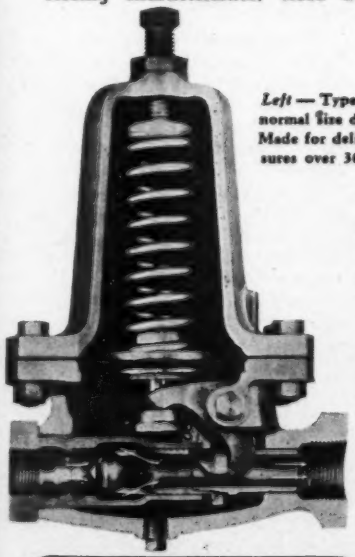

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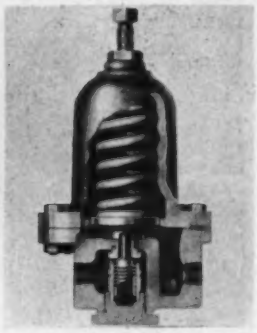

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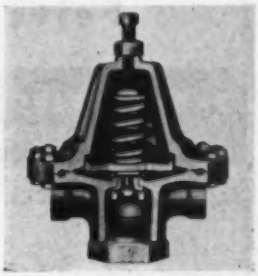

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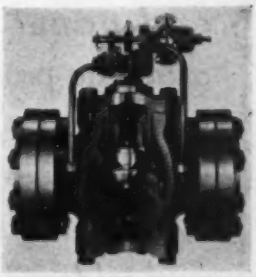

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work, ϕ' should vary in proportion with the torque; in the interest of simplicity and directness, the friction is expressed only as torque in the present work.

The stocks employed in this work were an unbleached southern kraft and an unbleached groundwood. The kraft was obtained in machine-dried sheets and the groundwood as wet lap. In disintegrating both pulps, a 5-pound semicommercial beater was employed, with the roll lifted completely off the bedplate.

Although the details of each experiment depended on the object of that particular experiment, the general procedure may be obtained as follows. For a series of experiments on varying consistencies, an approximate amount of the thickened stock required for 3% consistency was placed in the stock container, to which was added water of the temperature necessary to adjust the temperature of the final mixture to 25 $1\pm$ C. and to give the desired volume of stock. This was thoroughly mixed by hand and by the use of a wooden stirrer. The consistency was then determined, as well as the freeness. The cylinder surface was cleaned with water and rinsed with 95% alcohol. The cylinder was inserted in the stock and fixed in the coupling device. The stock around the cylinder was mixed again by hand, after which the desired measurements were taken.

After finishing measurements at this consistency, the cylinder was removed and washed with water and alcohol. Portions of the stock were removed, and the stock remaining in the cylinder was diluted with water to give a lower consistency. A consistency measurement was made and this stock used for further experiments. This procedure was repeated for as many consistencies as desired in the particular experiment.

A deduction concerning the flow of kraft stock over a solid surface can be drawn from the experiments on agitation and consistency of the stock. Below the critical consistency, flowing kraft stock will have only one type of flow at all speeds. The friction loss will increase uniformly with speed, to quite high speeds. However, when the consistency is above the critical value, the flow may take on any one of three types. Below the critical speed, only one type of flow is possible; above the critical speed the flow will be of the instantaneous type over the first part of the course of flow, but farther along the equilibrium type of flow, involving a lower frictional drag, will set in. Thus the over-all frictional loss will involve (at higher speeds and consistencies) two kinds of flow—a plug flow over the earlier portion of the course, and a transition to equilibrium flow over the remainder of the course—and, accordingly, the average frictional loss per unit length of the course will depend upon the length of the course.

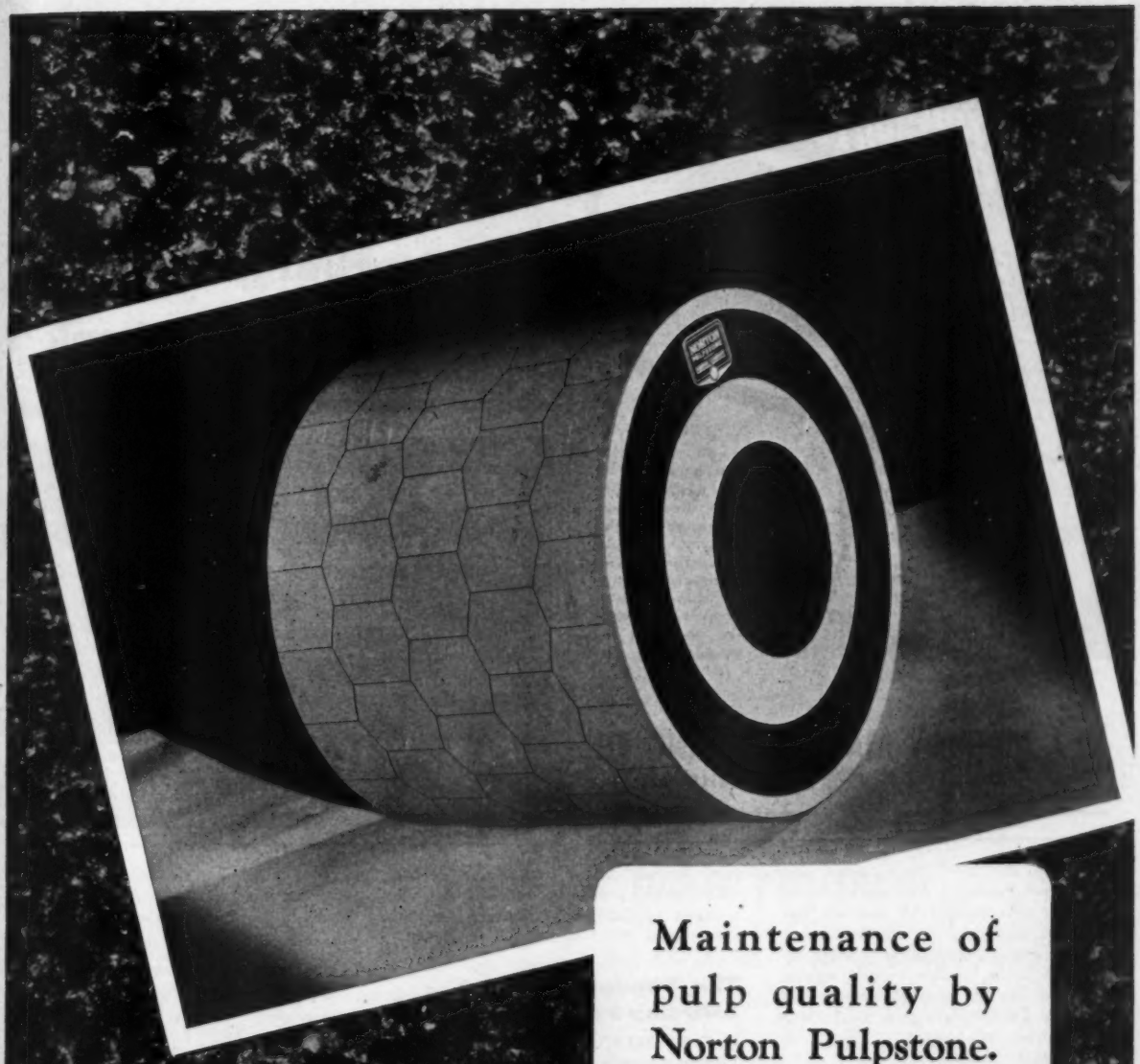
In studying the influence of surface roughness on the time required for the stock to shift its structure from that giving the instantaneous torque to the form giving the lower, equilibrium torque, it was found that the transition time was appreciably smaller for rough surfaces. This fact has a significant bearing on the interpretation of certain results on the friction of flow of stock in smooth and rough pipes.

The fiber-bunching or balling tendency of a stock, which appears to be related to fiber length, is evidently associated with the flow phenomena thus far described. Groundwood pulp, which exhibits very little bunching, does not exert different forms of torque-speed relationships depending on speed and consistency, as in the case of the kraft pulp. Moreover, the addition of a dispersing agent, which decreases the size of the fiber bundles, to the kraft pulp has a profound effect on the torque-speed relationship.

Upon the basis of the conclusions drawn from the experiments which were performed, a theory of the mechanism of the flow of stocks in pipes has been developed. No attempt has been made to correlate quantitatively the actual values of frictional stresses and speeds obtained in these experiments with friction losses and velocities of stock flowing in pipes. However, qualitative correlations of the measurements made by means of the rotating cylinder instrument with friction losses at various speeds of stock flowing through pipes has given a theory of this flow in pipes which agrees with all the known data and explains many of the apparent discrepancies which exist. This theory assumes the flow of a long-fibered stock exhibiting the flow phenomena displayed by the unbleached kraft employed in this study. Groundwood stock does not display the peculiarities of flow in pipes which have been reported for such chemical pulps as sulphite (Forrest, F., and Grierson, G. A. H., *Paper Trade J.* 92, no. 22:39-41, May 28, 1931; *Tech. Assoc. Papers* 14:259-261, 1931).

The explanation of the peculiarities of the flow of stock in pipe lies in the fact that two entirely different flow types exist at the same velocity under the correct conditions. These differences exist, not across the diameter of the pipe, as some investigators have suggested, but along the length of the pipe. Under certain conditions of fiber length, consistency, and velocity, a pipe carrying stock has part of its length under instantaneous plug flow conditions and another portion under equilibrium flow conditions, there being a relatively short length of pipe between these portions in which transition occurs. With this conception, a clear insight into the peculiarities of stock flow is obtained.

Conflicting results have been reported for the relative head losses in copper and iron pipe. It is well known that a copper pipe is smoother than an iron pipe, yet the head loss in a copper pipe has been observed at times to be greater than that in an iron pipe. The above theory explains the apparent discrepancies. An experiment on surface roughness showed that the critical time is greater for a smooth surface than for a rough one. In experiments with iron and copper pipe, Brecht and Heller (*Wochbl. Papierfabr.* 66, nos. 14, 18, 20, 23, 25, 28, 31, 34, 38, 40, 1935) found that the friction loss curve for iron reached a maximum at a lower



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velocity than the curve for a copper pipe of the same diameter. The above theory shows that this results from the fact that commercial iron pipe is much rougher than commercial copper pipe. Their results showed that, in two velocity regions the friction loss in iron was greater, but that in the intervening region the friction loss in copper was greater. This is in accord with the theory.

One of the outstanding facts concerning the pipe friction measurements made by various investigators is that no two sets of data agree on the values of pipe friction. The discrepancies are easily explained in the light of the theory. Because of the existence of two states of flow, each of which gives different values for head loss per foot of pipe length, the average value of head loss per foot for any length of pipe depends upon the total length of the pipe being measured. Thus, in order that two investigators may obtain the same results, they must each use the same pipe length for their measurements.

Differences in pipe length would be the main source of discrepancies between the results of different investigators. However, the theory indicates several other factors which will affect practical measurements. Since the amount of turbulence produced in the pump influences the degree of agitation of the stock, the type of pump employed will affect the observed head losses. Also, the actual pipe layout, the number of elbows employed, etc., would affect the results on friction per foot of pipe, because elbows, valves and certain other devices produce turbulence, and the agitation produced by turbulence tends to bring about the instantaneous plug flow.

The Fundamentals of Asbestos Friction Materials

R. T. HALSTEAD, in charge, Packing and Friction Materials, Section 1, Research Laboratory, Johns-Manville Corp.

From a consideration of the factors involved in applying a brake, it may be concluded that a satisfactory friction material must possess the following performance characteristics:

1. At all operating temperatures it must have a sufficiently high coefficient of friction to perform satisfactorily.
2. It must not wear too rapidly.
3. It must not abrade the opposing metal surface too rapidly. Each of these listed characteristics will be discussed briefly.

The ideal friction material is envisaged as one showing a coefficient of friction which is independent of temperature.

Commercial friction materials in general usage today rarely exhibit coefficients of friction in excess of 0.60. A conventional classification of friction materials into high, medium, and low friction categories would normally approximate the following ranges of values:

Class	*Coefficient of Friction*
High friction	0.60-0.45
Medium friction	0.45-0.30
Low friction	0.30 and less

The effect of temperature on the rate of wear of standard types of friction materials is illustrated by the following data:

TABLE II. RATE OF WEAR OF STANDARD TYPES OF FRICTION MATERIALS EVALUATED AGAINST CAST IRON AT VARIOUS TEMPERATURES

Temperature of Test Deg. Fahr.	Rate of Wear (Cu. Inch per h.p.-hr.) Woven Lining	Rubberized Fabric Lining	Molded Lining
160	.0012	.0015	.0014
350	.0062	.0028	.0030
500	.0223	.0130	.0073
800	.7620	.5630	.0611
1000	——	——	.2047

Rate of Wear (Cu. Inch per mm

The desirability of a friction material which will last as long as possible without wearing out is obvious. Yet, this factor of very low wear may give rise to other serious operating deficiencies in the friction material such as loss of braking effectiveness due to a glazing of the wearing surface of the friction element.

When a standard type of friction material is tested against various metals, it is interesting to note how the rate of wear is affected. Steel and cast iron surfaces normally cause approximately the same rate of wear of the friction element, although steel is more prone to score under severe service conditions and may thereafter give rise to a more rapid abrasion of the friction element.

It may be safely concluded that the rate of wear or abrasion of friction materials is influenced far more by temperature than by the composition of the smooth metal surface rubbing against the friction element.

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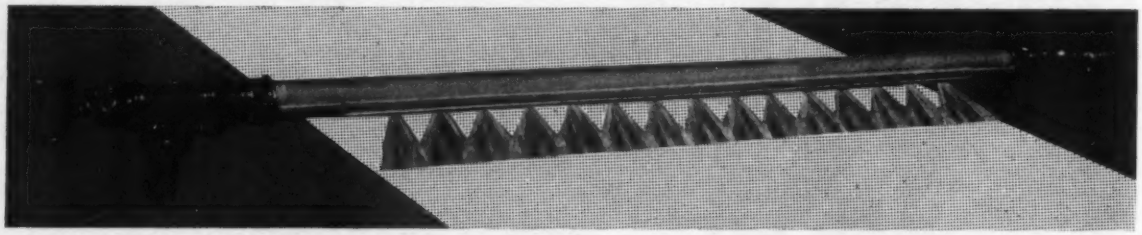

BULLETIN 134

SANDUSKY FOUNDRY & MACHINE CO.

Sandusky, Ohio

The main difference between steel and cast iron in their tendency to abrade probably resides in the relatively increased tendency of the steel to yield metal splinters or slivers as a product of abrasion. These steel slivers readily embed themselves in the wearing surface of the friction element and thereafter cause further scoring of the opposing metal surface.

In contrast to steel stands cast iron which tends to yield a fine dust as a final product of its abrasion. The cast iron member in this case is polished and gently eroded, but is not prone to be seriously roughened throughout its period of contact with the friction element.

In addition to scoring and erosion of the drum, another form of deterioration of the metal member is well known. Under severe service conditions a disruption of the drum surface can in certain cases be readily produced. Failure in these instances is due to the development of heat checks or cracks in the wearing surface of the drum. It is probable that this type of failure is due to a surface fatigue of the metal which produces fine surface fissures that normally become progressively worse as the braking applications continue. Probably all friction materials tend in varying degree to heat check the opposing metal member if the service conditions are severe. It has been noted, however, that friction materials that are relatively abrasive in their action on the metal drum are much less prone to heat check, due no doubt to their ability to scour the metal surface and eradicate heat checking fissures in their incipiency.

The resilience of a friction material also appears to be a factor in determining whether or not that friction material will tend to cause heat checking. In accordance with this concept, the more resilient type of friction material will produce less mechanical deformation of the drum due to its ability to yield locally and accommodate any inequalities in the contour of the drum surface.

Also, on this basis, the more malleable metal drum, with its greater tendency to flow locally and thereby accommodate the surface inequalities, should be more resistant to the development of heat checking than would a less malleable metal drum. Consistent with this premise, steel drums tend to heat check less readily than do those made of cast iron.

In addition to the foregoing, there are other characteristics which must be considered in reviewing the qualities of a friction material, i.e., the thermal swell of a friction element must be of low order of magnitude; the frictional characteristics must not become unduly erratic due to the presence of moisture; brake or clutch applications must be possible without the development of appreciable noise; the physical strength of the friction element must be such as to prevent any shearing action by the rivets; and it is often important that the friction material be capable of operating in oil without undergoing any appreciable disintegration or softening.

It is asking much of any organic material to exist and function as a stable entity at temperatures of a 1000 Fahr. and higher. Vulcanized rubber softens at 300 Fahr. and the best thermal setting resins begin to carbonize at 600 Fahr. Is it, therefore, necessary to rely on inorganic raw materials, either metallic or non-metallic, in order to secure adequate thermal stability in the friction element? The best procedure calls for the utilization of all of these types of raw materials, organic, metallic and inorganic, each of which, when blended with the others, contributes valuable physical properties.

The selection of asbestos as the bulking

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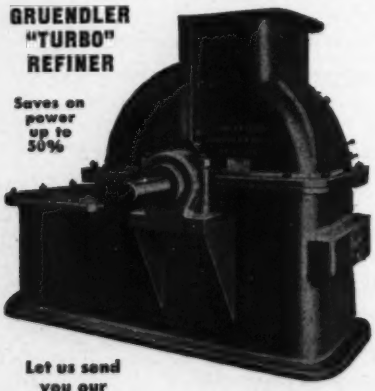

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or preponderant ingredient in friction materials is logical. In this material nature has provided in abundant quantities a noncombustible, heat resistant, inorganic fibrous substance which can be readily molded, carded, braided, woven, or otherwise processed into a variety of finished goods. There are several kinds of asbestos fiber commercially available, each differing substantially from the others in chemical composition.

It is hard to compare the relative performance of different fibers since it is difficult to establish whether the massive fiber bundles, as obtained from the mines, have been reduced in the processing operations to fibrous dimensions which are comparable in each case. It is interesting to note that the fiber mass can be reduced to microscopic fiber pencils of relatively small diameter, that these latter may be further subdivided into fibers of microscopic size. However, these microscopic fibers, when viewed under the electron microscope, have been observed to be aggregations of still smaller fibers, estimated to be of the order of 0.01 micron in diameter. There is, of course, no assurance that these fibers of .01 micron-diameter represent the ultimate in minimum diameter to which they may be reduced. This unique structural feature of asbestos, coupled with its relatively excellent heat stability, provide basic reasons why it is so outstandingly superior to other inorganic fibers, such as glass wool or slag wool, for use in friction materials.

The next major ingredient in friction materials is the bonding medium which cements together and seals the asbestos fibers into a solid and relatively dense structure. Pitches and drying oils were at one time widely used to bond the fibrous structure together to give a friction element. Rubber was used in this connection and, more recently, thermal setting resins have been employed, either by themselves or in combination with various other binders. Such compositions have specific physical characteristics which reflect the nature of the binder to a decided degree.

To the fundamental composition of fiber and bond is introduced secondary ingredients which may be designated as friction modifiers, of which metal is a customary addition. The metal addition, generally brass, zinc, or lead, confers specific properties on the composition. In this connection, brass contributes to frictional stability of the friction element, also to an improvement in its wear qualities and, when introduced as wire in the case of woven fabrics, results in improved tensile strength and resistance to shear. Introduction of zinc also helps to improve wear characteristics and to stabilize the frictional qualities, but such stabilization is obtained at the expense of the general frictional effectiveness which simultaneously undergoes an appreciable reduction. Lead additions function primarily as high temperature lubricants, aso in minimizing any abrasive qualities shown by the composition.

In friction materials of the nonfabric type, a second type of modifier, namely, a friction particle, is oftentimes introduced into formulations in order to impart spe-

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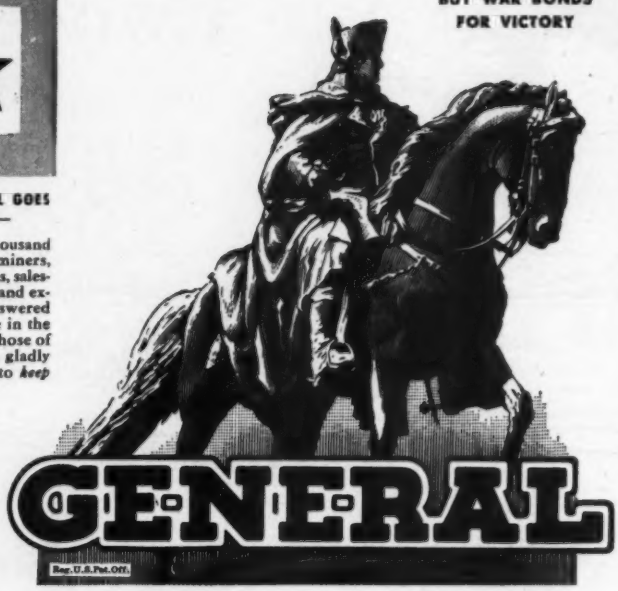

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cific frictional and wear characteristics. The particles used range from groundup tire peelings to complex resinous admixtures of outstanding thermal stability; they embrace the field of carbonaceous materials such as anthracite, coke, or other pyroligneous product; even ordinary silica has found its way into certain types of friction elements, although such usage is not general and is considered unorthodox.

Development of new products in the field of resin chemistry offers a great promise to the friction materials industry which recognizes this fact and is conscious of the great opportunities for further improvements which lie ahead.

Developments in the Manufacture of Structural Products from Hydrolyzed Wood

ROBERT M. BOEHM, Director of Research
Masonite Corporation

Previous articles have described the Masonite process for the manufacture of structural board products and various developments in the field of lignocellulose plastics, byproduct chemicals and other materials. (Boehm, Robert M., Lignin Plastic, *Modern Plastics,* Oct., 1939), (Boehm, Robert M., Plastics and Chemicals from Wood, *Paper Trade J.,* May 2, 1940), (Lee, James A., New Products from Wood, *Chem. Met. Eng.,* Feb., 1940), (Boehm, Robert M., Lignin Plastics, *Modern Plastics,* Oct., 1937). The present article will give briefly a recapitulation of the raw material and processes and some of the normal products but will be devoted primarily to the research and development activities which have made possible the production of new types of products required in the present emergency together with descriptions of the properties and uses of such new types of products and a description of present and postwar possibilities.

Both hardwoods and softwoods are used, the former consisting largely of gum, magnolia, poplar, and other Southern hardwoods and the latter of shortleaf and longleaf pine. The wood is received at the plant in bolts 5 feet long. All wood is purchased in the peeled condition although rough wood may be used by modification of the process.

Softwoods and hardwoods are kept separated through the wood room and shooting operations and are then blended in proportions to give the desired properties in the finished product. Some of the products consist entirely of softwoods, others entirely of hardwoods, and some of mixtures of the two types of fibers, exploded separately, in the proper proportions to give specific results.

The explosion operation is the most rapid method of fiber production which has ever been utilized. The entire cycle in the guns run somewhat under 1 minute, including filling, preheating, bringing up to pressure, holding at pressure, and exploding. A steam pressure is used of 1000 pounds per square inch, equivalent to about 550 Fahr. or 285 C. The time-

temperature curve is extremely important, as little as 0.5 second difference in the time giving distinct changes in the fiber produced. This ratio must be coordinated with the type of wood and the size and moisture content of the chips.

When the steamed chips leave the gun, travelling at something like the speed of a bullet, they are exploded into a brown, fluffy mass of moist fiber. Entering a cyclone, the steam is let off and condensed and the exploded fiber falls into a stock chest where it is mixed with water and pumped through washers, refiners, and screens, and where a small amount of waterproofing material may be added. It is then formed into a sheet on a modified fourdrinier forming machine, trimmed, and cut to lengths by a travelling cutoff knife. At this stage the material is known as a "wet lap."

According to the modifications of the process, this wet lap may be fed directly into steam heated hydraulic presses for the manufacture of insulation and pressed wood products or may first be dried to essentially air dry condition and converted into other types of hardboard products, some of which will be described later.

Certain of the hardboard products designed for unusual service are "tempered." This includes the impregnation of these products with a siccative material, followed by complete curing by polymerization and oxidation. This results in a product of much higher strength, water resistance, abrasion, and other desirable properties.

The boards discharged moisture free from the presses or from the tempering operation are thereupon humidified to a moisture content of about 5 per cent, approximating equilibrium conditions with the atmosphere. In this way, undue expansion, warping and the like are eliminated.

The products vary in specific gravity from approximately 0.02 to 1.44, the practical minimum and maximum possible from lignocellulose material. Such products have been described in some detail in a previous publication. (Boehm, Robert M., Plastics and Chemicals from Wood, *Paper Trade J.*, May 2, 1940).

In the early stages of the steaming operation in the guns, a considerable quantity of acetic and formic acids is formed. These act rapidly on the wood structure to produce an acid hydrolysis which is controlled by the temperature and time in the gun. The degree of this hydrolysis is vital in the manufacture of the many types of products. It may be modified by buffering or in other manners, but in the general process, the time and temperature conditions offer sufficient flexibility for the manufacture of a wide range of products having specific properties.

According to the degree of hydrolysis, the lignin-carbohydrate bond is broken. The cellulose portion of the wood is not greatly changed in the normal process, but may be somewhat broken down with increasing degrees of hydrolysis. Since the cellulose portion forms the framework or structure of the board products, much as it does in the original wood, the ability to prevent excessive degradation of this

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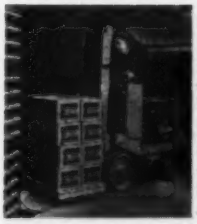
Equipped with telescoping uprights a Baker Hy-Lift Truck can enter a box-car door with ease, and tier material inside the car, conserving shipping space. (See illustration). Actual savings in costs of loading and unloading operations with Baker Trucks have been reported as high as 75% over former methods.

Where material lends itself to shipment on wooden pallets, Baker Fork Trucks can greatly reduce time and cost of loading and unloading. One Company reports savings of 25c per ton, or $12.50 per car—at the same time releasing seven men for other work. This procedure is called "Unit Handling."*



Baker Crane Trucks have solved many difficult loading problems, where heavy, bulky parts or materials are to be shipped on gondola or flat cars. Illustration shows a crane truck with a large hook making quick work of loading heavy coils of wire at a wire mill.

A large aircraft manufacturer uses Baker Hy-Lift Trucks to unload crated airplane engines weighing 2100 pounds from the boxcar in which they are shipped. One operator with a truck transports the engines either to storage, or to the assembly line—relieving a number of men for other duties.

Highway-truck loading with Baker Fork or Hy-Lift Truck requires no loading platform. Sacks of bulk materials may be handled or shipped on pallets, eliminating the need for individual handling, and permitting tiering of material in warehouse or carrier.

** A bulletin "Unit Loads—Their Handling, Shipment and Storage" has just been published by the Industrial Truck Statistical Association. A copy will be mailed upon request.*

WRITE FOR YOUR COPY

Plant and production managers, traffic managers, superintendents, purchasing agents and any others concerned with material handling will find the new Baker Catalog No. 52 a valuable reference.

BAKER INDUSTRIAL TRUCK DIVISION

of The Baker-Raulang Company

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Baker INDUSTRIAL TRUCKS

He profits most who serves best.

KALAMAZOO VEGETABLE PARCHMENT CO.

Parchment — Kalamazoo — Michigan

fraction while securing the desired degree of hydrolysis is highly important.

The hemicellulose fraction, under the conditions of acid hydrolysis obtaining, are largely converted to water soluble or water dispersible condition and are removed by a washing operation. The removal of the correct proportion of this fraction is very important in the properties secured in the final product and must be controlled with a considerable degree of exactitude. Apparatus for the recovery of these hemicellulose fractions in a concentrated condition has been installed and definite plans are under way for the conversion of this fraction to furfural as well as to the recovery of acetic and formic acids and other wood byproducts.

In the breaking of the lignin-carbohydrate bond, the lignin is converted to a state in which it is soluble in certain organic solvents. The degree of hydrolysis determines the thoroughness of the breaking down of this linkage and consequently the percentage of lignin converted to soluble form. The lignin fraction also undergoes a considerable degree of depolymerization but apparently without change in its chemical properties. In this respect, it is still "native lignin" susceptible of the same reactions as the lignin in the original wood but having undergone the breaking of the lignin-carbohydrate linkage and a considerable degree of depolymerization. As a result of this, lignin has become "activated" and is in suitable condition for re-exerting its bonding powers when subjected to the proper conditions of moisture, temperature and pressure. This bonding power is to a considerable extent thermosetting and in this way bears a marked resemblance to the synthetic resins. The entire mechanism of this bonding effect is not known as yet but methods of activating such effect together with many modifications are known and practiced in the manufacture of the newer types of products.

The removal of the lignin fraction by organic solvents has made possible a systematic study of the chemistry of this fraction. This is underway intensively at the present time. However, in the normal process, no such separation of the lignin components is required, the degree of activation and the percentage of soluble lignin being determined by the shooting conditions having in mind the type of finished product it is desired to make. However, this fundamental research work on the lignin fraction has enabled us to predict its behavior and consequently to manufacture products having specific properties. This ability to manufacture such special products has been particularly important in connection with the present emergency.

Airplane die stock is manufactured by a modification of the normal process wherein it is possible to make products of great density and thickness. This involves initially converting the fiber to a semiplastic condition so that the bond secured in the press is sufficient to give the qualities of high density and resistance to compression. Die stock is customarily manufactured in thicknesses up to 2 inches although panels have been produced for special purposes up to 6 inches thick and in 4 foot by 12 foot panels.

Some time ago the company was approached by a certain governmental agency to manufacture a special type of hardboard product for the fluorescent lighting industry to replace metallic reflectors. Such a product was developed having high dimensional stability and capable of being bent to the shape of the reflectors. It was necessary to install equipment to make this bend but the product was quickly developed and placed in production and a good many miles of fluorescent lighting reflectors are now operating in defense plants throughout the country.

Another development of special interest which called on the accumulated research experience of the company was in the development of a special product for lofting board to be used in the aircraft and ship building industry. This is another case where a product of this type was called on to replace metals but proved to have certain unique properties which made it superior to the metals in some respects. The requirements here were high dimensional stability, hardness, strength, and the ability to take drawings, either direct or by coating the panels with a photographic emulsion so that large scale prints could be transferred directly to the face of the panels. Such panels are filed and constitute

(Concluded on page 253)

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Now . . .

Our engineering and manufacturing facilities are being devoted—

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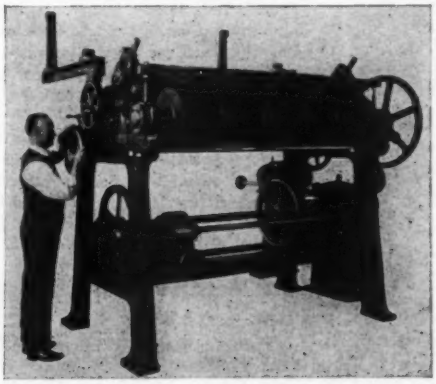

All anti-friction bearings—for cutting preprinted rolls of paper to mark—manual or automatic photoelectric control.

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GARLOCK Packings, Gaskets and KLOZURE Oil Seals are backing the attack on the battle fronts throughout the world. Engineers in the U. S. Armed Forces everywhere rely on GARLOCK dependable performance. And on the home front our war industries are taking advantage of the long, superior service of GARLOCK products to achieve top-speed production of planes, ships, guns, shells—for a quicker Victory.

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GARLOCK 117 globe and angle valve stem packing is equally effective against high pressure steam, hot or cold water, or oil. Furnished either braided or twisted in all sizes from $\frac{1}{16}$" to $\frac{3}{4}$".

GARLOCK

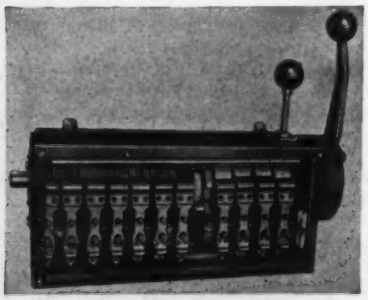
NEW EQUIPMENT AND SUPPLIES

New Basket for Strainers

Increased straining area and rugged construction are the features of new strainer baskets announced by the Blackmer Pump Company, Grand Rapids 9, Michigan. The baskets are constructed from heavy-gauge perforated sheet and are available with various size openings. According to the manufacturer, the use of the perforated sheet increases the net straining area up to 10 times the pipe area. Part of the gain in the straining area is achieved by the use of spot welding. The new baskets will be used with all strainers in the Blackmer *Ezy-Kleen* line.

Controller for Electric and Gas-Electric Trucks

The Elwell-Parker Electric Co., Cleveland, Ohio, has announced the new M-79 Simplified Four-speed Reversing Controller for electric and gas-electric trucks. This controller uses resistance on the first speed only. An additional power saving is attributed to the manipulation of the motor fields, connecting them in series on first and second speeds, which produces greater torque with less current consumption. The controller is installed on all Elwell-Parker Electric or Gas-Electric low and high-lift trucks in capacities up to 10,000 lb.



O_2, CO_2, CO, and H_2 Gas Analyzer

Cambridge Instrument Company, Inc., 3732 Grand Central Terminal, New York, N. Y., has announced a gas analyzer for determining the percentages of O_2, CO_2, CO, and H_2 simultaneously, and continuously recording the amounts on a single chart. The recorder, operating directly from an alternating current supply line, may be located at any required distance from the sampling point. Likewise, the instrument can be furnished with contacts for operating warning signals or to actuate various control circuits.

In the operation of a typical unit, a continuous sample of the gas is drawn into the analyzer by means of a water bubbler-aspirator. The exact detail of the analysis procedure varies with the constituents of the sample, but may involve a chemical absorption and/or combustion. The aspirator not only draws in the sample gas but meters it, as well as the air which may be required for combustion in the analysis procedure.

The recorder is automatically connected to the circuit of each analysis cell in succession, the duration of each connection being one minute. There is no additional time lag between points because the gas sample flows continuously through all cells.

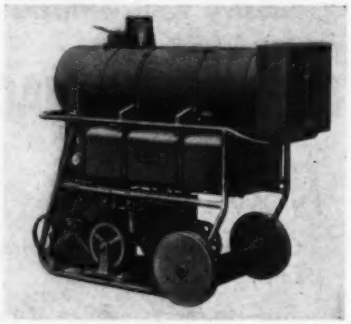
In all applications the results are recorded directly without any corrections or interpolation of any kind. A continuous record of the analysis is provided on a 10-in. strip chart, the four different registrations (one for each gas) being shown by different colors and numbers on the chart.

Portable Multi-Service Heater

Weighing only 270 lb. (tank empty, less ducts) and with an output rating of 250,000 Btu's per hour, the *Janitrol* portable heater has been announced by Surface Combustion, Toledo, Ohio. This heater will operate on any grade of gasoline, kerosene, and with certain modifications, other liquid fuels also may be used.

Equipped with gasoline-engine or electric-motor drive and mounted on a two-wheeled carriage, the unit can be moved in wheelbarrow fashion or can be pulled sled-fashion over snow, ice or mud. Draw and push bars, as well as lift bars, are incorporated into the frame.

Some of the features of the design are: Failure of motive power shuts off both fuel and air completely; no draft required for exhausting products of combustion, gasoline engine exhaust connected through combustion air blower; air delivered by positive pressure type blower; hand lighting or electric ignition available; 25-gallon tank provides sufficient fuel for 8-hour operation without refilling; all parts readily accessible; and a pop-off type relief valve incorporated in combustion chamber for relieving any sudden surge of pressure possible to create.



The heater, among numerous other possible applications, is suggested for temporary localized heating in unheated warehouses and other buildings; supplying heat for concrete mixing or preventing concrete from freezing during severe weather; thawing frozen roll equipment treads, brake drums, radiators, etc.; heating personnel outdoors during sub-zero weather; and localized heating in factory yards and other locations beyond the limits of regular heating systems.

Low Temperature Metallic Flux

Metallizing Company of America, 1330 West Congress St., Chicago, has announced a low temperature metallic flux. According to the manufacturer, this flux has a lower melting temperature than soft silver solder on initial heats and once activated will work on temperatures slightly higher than 60/40 solder. The manufacturer also states that tensile pulls of 2500 psi have been made without the metal deposit separating from the surface on both ferrous and non-ferrous metals. Designated as *Mogul Flux*, it is available in sealed, metal, 1-pound cans only.

Two Hot Wax Dip Tanks

Aeroil Burner Company, Inc., Park Ave. at 57th St., West New York, N. J., has announced two electrically-heated portable hot wax dip tanks, the Twin Waxmaster and the Waxmaster Senior, as additions to its line of hot wax dipping equipment.

The Twin Waxmaster has two compartments, each with a dipping space of 25 in.

Fibre Paint Cans Save Tons of Steel Daily

The Sherwin-Williams Co., well-known paint manufacturers, use Kraft wrapping paper and non-critical materials to manufacture unbreakable, leak-proof, fibre paint cans, following a process perfected by their own engineers.

The first step involves slitting rolls of Kraft wrapping paper into 4" wide strips, and winding these strips into compact, uniformly-wound rolls. This is done at high speed, 1,000 feet per minute—with CAMACHINE 10-11, illustrated.

The 4" wide rolls of Kraft converted on the CAMACHINE, are then transferred to a spiral tube-winding machine, shown in the illustration, producing a continuous tube. The tube is sawed off into yard lengths, for convenient handling, on a gang cutter, which cuts, for example, four tubes from the 36" length. Top and bottom rims are crimped on the tubes. Each can is then tested for leaks on a special machine and the job is done.

This is just one more instance of the way CAMACHINES help harassed production engineers save critical materials for the war effort. Further details on CAMACHINE 10-11 are yours for the asking.

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CAMACHINE

THERE'S A PLACE FOR
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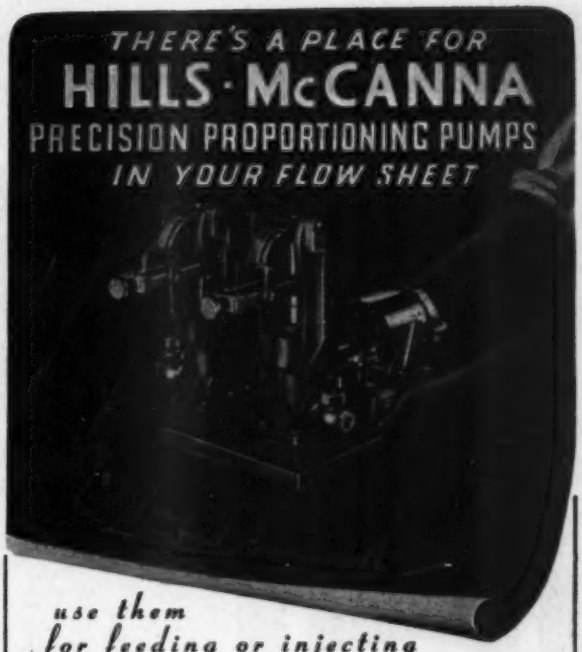
PRECISION PROPORTIONING PUMPS
IN YOUR FLOW SHEET



use them for feeding or injecting

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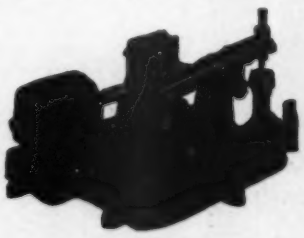
THESE pumps are mistake-proof, thereby removing the uncertainties of batch methods by feeding accurate dosages to ± 1½%, at exact intervals and with mechanical regularity. Available in 8 types in over 200 sizes to suit any mill condition. Capacity ratings from 0 to 1800 G.P.H., pressures from 0 to 22,500 p.s.i.



Type "R", 2 feed pump with motor drive. Meal for dry injections, boiler treatment applications, caustic and acid proportioning, and other services. Built in 30 sizes with a capacity range of 1.03 to 31.30 G.P.H. at pressures from 190 to 1200 p.s.i.

Type "U", 2 feed pump with motor drive. A small capacity high pressure pump for acid and caustic injection service, pilot plant work, laboratory experiments, etc. Built in 45 sizes, with capacity ratings from 1.02 to 31.20 G.P.H. at pressures from 190 to 1200 p.s.i.

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Investigate the possibilities which these pumps offer. Catalog P-41 upon request.

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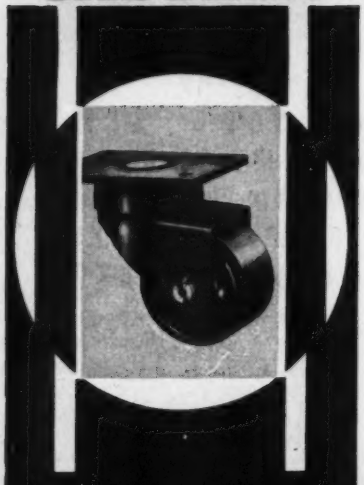
PROPORTIONING PUMPS ● AIR & WATER VALVES ● CHEMICAL VALVES
MARINE VALVES ● FORCED FEED LUBRICATORS ● BOWMETAL CASTINGS

Best by Test

Pre-tested

DARNELL CASTERS



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by 12 in. by 9¾ in. One compartment may be used for melting wax for spraying. It is provided with a draw-off cock and an outlet for spray line.

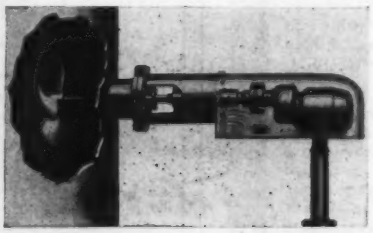
The Waxmaster Senior has a dipping space of 25 in. by 25 in. by 9¾ in.

According to the manufacturer, it will safely heat and melt approximately 150 lb. of solid wax in 50 minutes.

Both models are equipped with dip baskets, heavy duty grilles, built-in thermometer, and thermostatic control, and are mounted on casters. Skid-mounted units also are available. The units are for use on any 110 or 220 volt line.

Side Entering Agitator

H. K. Porter Company, Inc., Pittsburgh, Pa., has introduced a side entering agitator that features outside repacking without draining of tank and without loss of liquid. According to the manufacturer, a repacking job on this agitator can be done in five



minutes. The new unit is completely weatherproofed so that it can be installed outdoors, if desired. Motor base and cowl are integrally mounted to agitator, and the unit is equipped with an adjustable support under motor base. Hinged weather-proof cowl on motor gives easy access to motor.

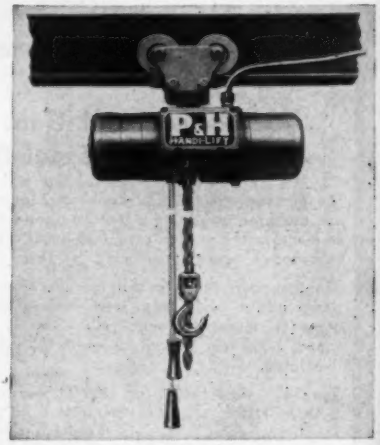
The weight of electric motor operated unit is 8,500 lb. Dual finned, lubricated stuffing boxes are provided for elevated temperature and high working pressure.

Propylene Laurate

The Beacon Company, Boston, Mass., has announced the availability of propylene laurate, a light amber, edible, non-hygroscopic oil. This product is dispersible in water, forming milky emulsions, the viscosities of which can be controlled. It also is miscible with alcohol, glycerine, etc.; and has a tendency for retaining moisture. This latter characteristic is pointed out by the manufacturer as of particular interest to the paper industry in connection with the use of propylene laurate as a general emulsifying agent.

Electric Chain Hoist

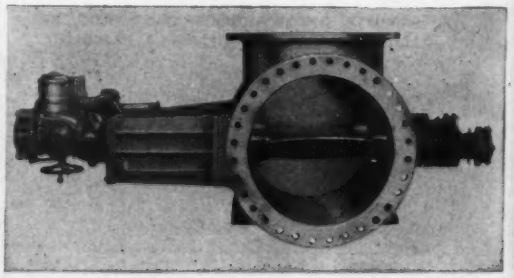
A 500-pound electric chain hoist, designated as *Handi-Lift* has been developed by Harnischfeger Corporation, Milwaukee 14, Wis. Interchangeable as to bolt, hook or trolley mounting, the hoist, in trolley service, can be suspended either parallel or crosswise to the beam. The hoist chain is proof-tested for 1,800 lb. Operation is by pull cord. Dual braking is provided by a spring-set electric motor brake which

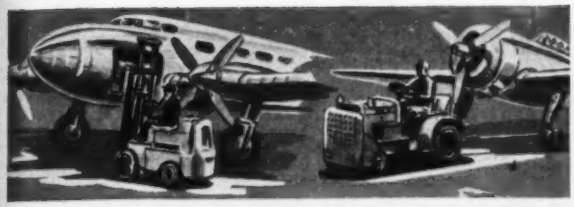


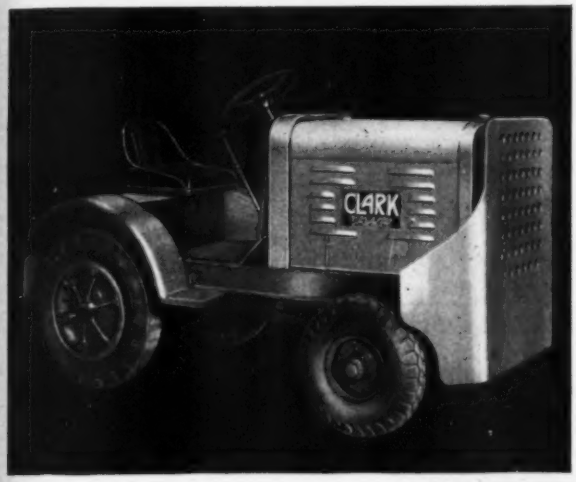
automatically releases when hoist is operated and sets instantly with shut-off current. Lowering control is by dynamic means supplemented by the spring-set brake which holds the load, should current fail. Other features include: planetary gear drive; flood lubrication; silver-to-silver switch contacts, and high-starting torque, reversible type motor with bearings sealed in grease. The unit operates on 3 phase 60 cycle, 220 or 440 volts.

Three-Way Butterfly Valve

A three-way butterfly valve (patent applied for), designed for quick interchange and mixing service and for all pressures from 15 to 900 psi, has been developed by R-S Products Corporation, Wayne Junction, Philadelphia 44, Pa. It is designated as type No. 604.







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TECHNICAL DEVELOPMENTS

These abstracts are of the latest developments found in the American and foreign press.

Bleaching of Kraft Pulps

This series of papers constitute a monograph with original data on the subject of bleaching. The first paper (which forms the basis of this abstract) deals with theory; one and two stage bleaching with hypochlorite and a triple stage bleach with elementary chlorine, as well as with the effect of excessive chlorination. The second paper takes up the introduction of excessive chlorination into the multistage bleaching process, treatment with hypochlorite prior to chlorination, and other pretreatments. The final article discusses critically the various commercial methods for bleaching kraft pulps, the use of sodium chlorite, and a general recapitulation also is given. The objectives of the entire investigation were to find the best conditions for practical bleaching of sulphate pulps with the retention of adequate strength properties and suitable whiteness. A Swedish pine kraft pulp was used. This came originally in the form of laps and was beaten slightly prior to use. In this treatment there was a very slight increase in the degree Schopper-Riegler. When the original pulp was thoroughly washed, its apparent lignin content dropped from 4.9% down to 4.5%, and the so-called "natural chlorine requirements" also dropped from 6% down to 5.5%. This latter "requirement" is defined as the highest per cent chlorine consumed *practically without residue* by the pulp when elementary chlorine acts for 1 hour at 20 degrees at a stock density of 3%. This figure for chlorine is not necessarily the greatest amount of chlorine that can be consumed by the pulp. For example, chlorine above that of the "requirement" may be taken up—when an excess of chlorine is present, but if this is the case, appreciable chlorine residues also remain after the treatment.

Elaborate strength tests were made under strictly comparable conditions on the original unbleached pulp and on the bleached pulp sheets, and the results were summarized as a single summative "strength quality number." Various strength tests were used, including the Brecht and Imset "initial tear" (in place of the Elmendorf "through tear"). Each of the usual strength tests were first made on the original beaten, but unbleached, pulp. This was arbitrarily taken as 100. The respective test made on the bleached pulp, was then calculated as a percentage based on the strength figure of the original pulp. For example, if the original breaking length of the unbleached pulp was 9690 meters, and that of the bleached sample was 9510 meters, the latter was recorded as 9510/9690, or 98.2%. This was done in the case of every test and with all bleached samples. The "strength quality number" was then calculated from the following formula:

$$\text{Strength Quality No.} = \frac{\frac{\text{breaking length} + \text{stretch} + \text{bursting strength}}{3} + \text{initial tear} + \text{folding endurance}}{3}$$

Whiteness of the pulp was then determined by a Zeiss leucometer. The "overall quality number" of a bleached pulp was defined as the strength quality number multiplied by the percentage of whiteness and divided by 100. The authors also defined "critical whiteness" (A) and "critical chlorine consumption (B)." (A) in any series of bleaching experiments was the percentage of whiteness that was found when the "strength quality number" of the pulp had finally reached 100, and then dropped rapidly below this point (and remained below 100 in all subse-

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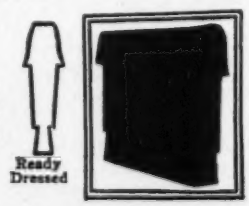

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quent experiments). (B) was the Cl consumption at this same point. The following bleaching experiments were made: (a) with NaOCl in one and two stages; (b) a three-stage bleach, in which chlorine, NaOH solution, and NaOCl were used in the order named; and (c) a brief excess chlorination. Single-stage hypochlorite treatments were carried out at 40 degrees using 5% stock density, until the bleach consumption was complete. When the "hypochlorite"-chlorine was 3-6%, the "strength quality number" was over 100%, but the percentage of whiteness was only 31-42%, thus lowering the "overall quality number." (A) was reached when 6.6% chlorine (of the hypochlorite) had been consumed, and from a practical standpoint (where strength is the main factor) this was the optimum condition for a single stage bleach.

However, this does not represent the best overall quality number, which is reached in single stage hypochlorite bleaching at 10% chlorine consumption. Here the percentage of whiteness was 63.5%, and the pulp still retained about 0.9% lignin. Even the whitest pulps obtained with this single step bleach showed tendencies to become yellow when stored. Even within a month, the whiteness had dropped from 3% to 9%. A two-stage hypochlorite bleach offers few advantages (in contrast to bleaching sulphite pulps). The only saving is a better utilization of the available chlorine. With the two-stage bleach (as carried out by the authors) the strength quality number never reached 100. In the three-stage bleach, chlorine was used in the first stage for 1 hour at 20 degrees using a pulp consistency of 3%. This was followed by treatment (usually) with 1.5% NaOH at the same temperature for half an hour. The final stage involved the use of NaOCl, and it was this third treatment that had the most degrading effect on the pulp strength. Even a high chlorine consumption in the initial stage did not materially effect the strength. Unfortunately a high chlorine consumption in the first stage did not obviate the detrimental effect on strength of pulp of the hypochlorite used in the third stage.

In a series of bleaching experiments with triple stages, it was found that the highest overall quality number was reached with 7% elementary chlorine in the first and 3% hypochlorite-chlorine in the last stage. The possibilities of improving the three-stage bleach were also studied, largely from the standpoint of modifications in the first two stages. The authors used relatively large amounts of chlorine and short periods of chlorination (5 minutes at room temperature with a 3% stock density). They then rendered the suspension alkaline without removing chlorine and allowed the bleach to follow its natural course. As they increased the initial chlorine concentration the second stage required more time, but even with 7% chlorine, alkaline treatment required only 6 minutes. Only when 9-10% elementary chlorine was used, was the time required by the alkaline stage significantly increased. With higher concentrations of chlorine, the entire second stage becomes so sluggish that it is impractical. However, in no case did the strength properties of the bleached pulp show much damage. The overall quality number and the strength quality number both were very good. There appears to be a marked advantage in using an excess of chlorine in the first stage. Lignin is largely removed, the pulp has high strength, relatively good whiteness, and is not subject to yellowing on storage. In fact, the whiteness was comparable to that of the much weaker pulp that had been bleached only with hypochlorite. G. Jayme and L. Rothamel. Papier-Fabr. 40, 26-32, 34-38, 44-47 (1942). *(This work will be continued in early issues.)*

Continuous Process for Pulping Wood and Annual Plants

In an illustrated lecture the author gives a description of what is termed the Muskau continuous pulping process. The advantages of the process are: simplicity of operation, low operating costs, possibility of using cheap raw materials, and satisfactory yields. The claim is made that by changing the proper variable during the actual pulping operation, the degree of pulping and the type of product may be altered at will without interrupting the continuity of the operation. Strength data are given on pulps made from wood waste, various straws, bamboo, potato stalks, esparto, etc. Fritz Offermanns. Papier-Fabr. Wochbl. Papierfabr. 1943, No. 2, 57-60.

PAPERMAKING PATENTS

IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington 4, D. C.

Pulp Composition and Paper

Patent No. 2,301,452. Joseph E. Plumstead, Wilmington, Del., assignor, by mesne assignments to West Virginia Pulp & Paper Company, New York, N. Y., a corporation of Delaware. No drawing. Original application Septetmber 4, 1931. Serial No. 561,241. Divided and this application June 29, 1940. Serial No. 343,095. 9 Claims. (Cl. 92—21). A composition comprising mechanical wood pulp having at least one sulfite of the group consisting of calcium sulfite and magnesium sulfite as an age deterrent filler distributed therethrough.

Coating of Paper

Patent No. 2,312,927. John D. Murray, Chicago, Ill., assignor to Murray Liquafilm Corporation, Chicago, Ill., a corporation of Illinois. Application September 22, 1938, Serial No. 231,102. 1 Claim. (Cl. 91—33). Apparatus for coating a sheet surface or the like comprising a heated bath of thermoplastic coating material, a rotatable deposit roll dipping into said bath and having its periphery formed with a plurality of closely adjacent recesses of known capacity for picking up material from said bath, a doctor blade wiping said roll periphery so as to leave a measured quantity of material on said periphery, a heated smoothing member contacting said deposited coating under pressure, said heated member comprising a springy flexible blade, and a rotatable roller backing the uncoated surface of said sheet.

Paper and Method of Making Same

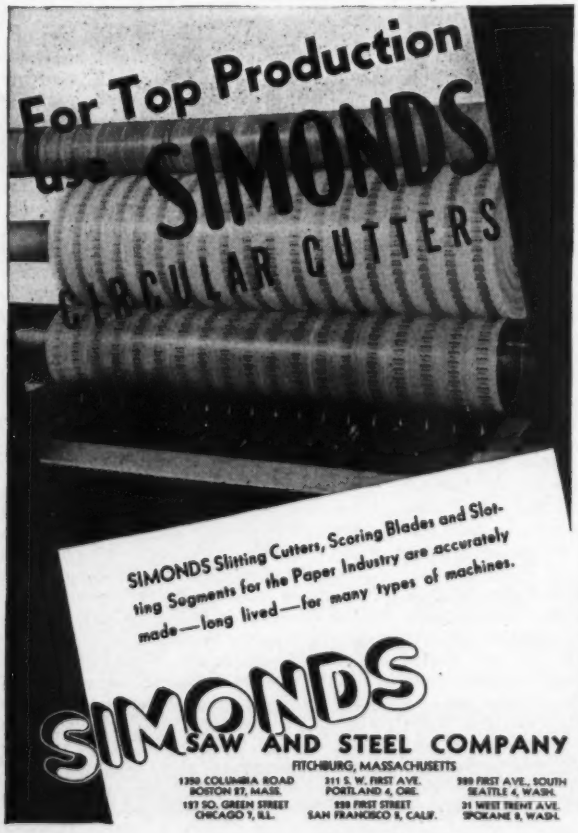
Patent No. 2,319,116. Lloyd L. Dodge, Chicago, Ill., assignor to Rhinelander Paper Company, Rhinelander, Wis., a corporation of Wisconsin. Application March 1, 1939. Serial No. 259,151. 8 Claims. (Cl. 92—39). 3. A sheet of paper impregnated with petrolatum and having a paraffine wax coating overlying the petrolatum impregnated sheet, said petrolatum having a melting point higher than that of the wax. 6. In the method of making a relatively transparent, pliable, moisture-proof sheet of waxed paper from relatively free paper stock by successively forming the stock into a paper web having its fibers lying mainly in the machine direction, drying, moistening, and supercalendering the web, the steps which comprise impregnating the web with molten petrolatum having a melting point higher than that of the wax used, regulating the petrolatum content of the web by doctoring the petrolatum so as to leave the web impregnated with an amount of said petrolatum insufficient to bleed through the wax, and thereafter applying a coating of paraffin wax to the web and over the petrolatum.

Moistureproof Sheet Wrapping Material

Patent No. 2,293,458. Maurice L. Ernsberger, Wilmington, Del., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware. No Drawing. Application July 23, 1940. Serial No. 346,994. 12 Claims. (Cl. 106—173). A thin, flexible, moistureproof sheet material comprising a film of a moistureproofing composition, said moistureproofing composition comprising essentially a wax, a binding agent and N-alkyl cyclohexane sulfonamide as the essential plasticizer.

Process of Preparing Wood Pulp

Patent No. 2,324,230. Fredrich Olsen, Soldon Feldman, and Lyle Melvin Sheldon, East Alton, Ill., assignors to The Cellulose Research Corporation, East Alton, Ill., a corporation of Delaware. No drawing. Application January 30, 1939. Serial No. 253,598. 6 Claims. (Cl. 92—11). 1. The process of preparing wood pulp comprising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the steps of digesting wood with a bisulfite solution by uniformly applying the said chemical and heat to each of the woody subdivisions until a pulp is formed with all the fibers having a bleachability of less than about 15% and terminating the said digestion before the cellulose viscosity has been reduced to less than the order of 10 centipoises, forming a water slurry of said pulp and chlorinating said pulp by uniformly and rapidly adding to said water slurry at room temperature an amount of gaseous chlorine expressed in pounds per 100 pounds of pulp equal to not less than 20% of its bleachability and causing said chlorine to penetrate and react with the chlorinatable content of the pulp prior to any substantial oxidation of the cellulosic components of said pulp, continuing said treatment until the bleach value of said pulp is reduced to not greater than about 1% and terminating said treatment before exhaustion of said chlorine.

Paper Machine Slice Assembly

Patent No. 2,325,016. David Warren, Madawaska, Maine, assignor to Fraser Companies Limited, Edmundston, New Brunswick, Canada. Application November 16, 1938. Serial No. 240,785. 4 Claims. (Cl. 92—44). 1. A paper making machine including a travelling carrier on which the pulp stock is deposited to form a sheet, frame members projecting upwardly above the carrier at opposite sides of said machine, a pair of plates slidably secured to the inner sides of said frame members for sliding movement in a horizontal direction of the frame members, a pair of swivel plates mounted for turning movement about horizontal supporting pivots carried by and movable with said first mentioned plates, a slice plate extending between said swivel plates and having its end portions slidably fitted in grooves formed in the opposing surfaces of said swivel plates, a vertically adjustable beam mounted on said swivel plates, said slice plate being secured to and supported by said beam.

Paper Making Apparatus

Patent No. 2,304,735. William M. Leeson, Glens Falls, N. Y., assignor to The Sandy Hill Iron & Brass Works, Hudson Falls, N. Y., a corporation of New York. Application August 4, 1939. Serial No. 288,403. 2 Claims. (Cl. 92—43). In a cylinder of mold paper making machine including a vat and slice mechanism, the improvement comprising, end brackets attached to the opposite end walls of the vat, vertically adjustable rods attached to said brackets, means for adjusting said rods, a centrally located support member vertically adjustable between said brackets and attached to the lower ends of said rods, side wall members on opposite sides of said support member, hinge means connecting the lower edge of said side walls to the lower edge of said support member, and independent adjusting means connecting the upper edge of said side wall members to the upper edge of said support member.

. . . Hydrolized Wood

(Continued from page 244)

essentially a lifesize blueprint of the parts in question. This panel was also successfully developed and has found wide application, not only as a lofting board, but for other purposes.

In the development of "Quonset" and "Stran Steel" huts as well as newer installations ranging from Greenland to the Tropics, the unique properties secured in the lignocellulose hardboard products have made these products ideally adapted for these purposes.

Other recent developments illustrating the flexibility of the lignin bond involves the manufacture of formed articles either from the finished board product or directly from the wet lap or dry lap. Examples of such products include ice boxes, some 250,000 of which have already been produced, chair seats and backs, structural shapes, and the like. While production of this class of material is now somewhat limited due to the necessity of confining essentially all of production to the demands of the war effort, the postwar field will find available materials which are new and which have outstanding qualities for special purposes.

Our knowledge of lignin is still far from complete. This statement could be applied to the entire field of hydrolyzed wood, but basically it is the "free" lignin which makes possible the unusual potentialities of this material.

New Catalogues and Publications

Allegheny Ludlum Steel Corporation, Pittsburgh, Pa.—This company has issued a 64-page treatise on the welding of stainless steels. The manual is based on the company's experience in this particular field and contains many full-color perspective drawings and diagrams illustrating the various methods employed and the physical and chemical phenomena which occur (or which must be prevented) when welding stainless steels. Chapters are devoted to the effects of heat on stainless steel, metallic arc welding, atomic hydrogen welding, oxygen-acetelyene welding, electrical resistance welding, and the welding of pluramelt steels. It is an elementary, practical instruction manual for student or beginner; and at the same time, a complete technical explanation which will be helpful to production men, engineers, designers or metallurgists.

The Allen Corporation, 9751 Erwin Ave., Detroit 13, Mich.—Just released, is a six-page, colored folder descriptive of the "Coni-Vane" turbine ventilator. It sets forth the principles involved in the unit and outlines construction details and specifications. A chart on the last page gives displacement capacities and a typical installation is photographed. Request Bulletin 30-D.

American Manganese Steel Division, Chicago Heights, Ill.—This affiliate of American Brake Shoe Company, has issued a 16-page booklet dealing with manganese steel for oil field service. It illustrates apparatus employed in the company's metallurgical research laboratory, and the use of the steel in sprocket wheels, drill stem bushings, and sheaves. The applications described in the book also suggest others where this steel may be used to obtain lowest cost in drilling operations.

Blackmer Pump Company, Grand Rapids 9, Mich.—A 6-page illustrated folder entitled "Facts About Rotary Pumps" is descriptive of the mechanism of Blackmer pumps and the type needed under varying conditions. The swinging vane principle, typical of this pump, is explained in detail, and photographs point the way to the selection of the right pump for every application. Request Bulletin 304.

Cochrane Corporation, 17th and Allegheny Ave., Philadelphia 32, Pa.—Bulletin 4076 "Degasification of Water" illustrates a number of equipments available for the removal of gases from water at various temperatures. It outlines methods for the removal of oxygen and carbon dioxide from water without the use of steam, and the removal of small quantities of ammonia, hydrogen sulphide and carbon dioxide simultaneously. It also illustrates different designs of Cochrane deaerators available for the elimination of gases in connection with boiler plants, and will prove of interest to all industries in which the removal of gases from either hot or cold water is important. Copies gratis.

Crane Company, 836 South Michigan Ave., Chicago.—This company offers a 32-page illustrated catalogue descriptive of its line of piping, valves and fittings. Its pages are replete with practical suggestions concerning the handling of valves, fittings, piping, screwed and flanged joints and welded pipe joints. The purpose of the manual is to make available the practical information developed by Crane.

Farrel-Birmingham Company, Inc., Ansonia, Conn.—The company has released an 8-page bulletin descriptive of its couplings. These couplings are designed for application where space limitations make a close-coupled connection necessary or desirable. The bulletin includes engineering details, application diagrams and tables of sizes, ratings and dimensions. Request Bulletin 446.

Fischer & Porter Company, Hatboro, Pa.—Catalogue 93-B illustrates the complete line of Bull's Eye sight flow indicators. Indicators for every industrial service are shown. For ordinary applications there is the "flapper" type with a hinged flapper which swings outward or upward to register the passage of fluid. A "drop-lip" type has a clearly visible lip so arranged as to register small or intermittent flows. Indicators for opaque flows, or with electric contacts to actuate external alarm devices, are among others shown, and of special interest is the new wheel type sight flow with turbine type blades that immediately shows low flows and changes in flows. The catalogue also gives information on sizes, dimensions, types of connections, etc., to simplify specification. Copies available.

General Detroit Corporation, 2200 E. Jefferson, Detroit 7, Mich.—Just off the press is a buyers' encyclopedia featuring more than 500 separate items in the fields of industrial maintenance, safety and fire protection. Profusely illustrated, it will be of interest to municipal and manufacturing executives and to those concerned with police and plant security. The book contains factual information on sizes and types of hose threads, nozzle and fire stream data, hose maintenance extinguishers, fire extinguishers, ladders, and on various types of fires. Many "hard-to-get" items are illustrated and the encyclopedia is a comprehensive manual on the entire subject of industrial protection. Request copies.

The B. F. Goodrich Company, Akron, Ohio—A catalogue on its recently introduced line of industrial clothing has just been published. It describes and illustrates the construction of Goodrich brand clothing, including fire coats, gen-

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WANTED—Used paper mill trimmer in good condition. Send description, price, etc. Address Box 355, Fritz Publications, Inc.

WANTED—New or used paper shredding machines or equipment, also used electric balers—100 lb. capacity. Address Box 356, Fritz Publications, Inc.

WANTED—Sales representatives to handle line of stainless steel products. Now calling on sulphite paper mills in New England and Wisconsin areas. Address Box 357, Fritz Publications, Inc.

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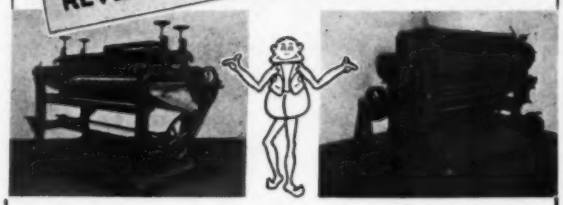

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eral purpose work coats, double back industrial coats, and standard police coats. It also affords details on the universal work pants and jacket, leggings and hat, as well as on the resin covered aprons now widely used in the mechanical and food industries. Request Cat. No. 12,000.

Ideal Commutator Dresser Company, Sycamore, Ill.—This company has issued a booklet which supplies information relative to new tool accessories manufactured by them as well as those previously on the market. Printed in two colors and profusely illustrated, it describes the magnetic chuck, "triple duty" live centers, combination etcher and demagnetizer, metal etcher, portable demagnetizer, electric tachometer, grinding wheel dresser and balancing ways. Sizes, types, and details of construction and operation are clearly outlined. Copies available.

National Production Company, 4550 St. Jean Ave., Detroit 13, Mich.—A new folding circular is descriptive of this company's "Safe Line" wire rope clamps. They are made of high tensile strength steel and coined to accurate dimensions. Details of assembly and construction are included and the manufacturer discusses advantages gained by use of the clamp.

Policyholders Service Bureau, Metropolitan Life Insurance Company, New York, N. Y.—A new bulletin, "Telling Employees About Their Company," is based on the prewar practices of some 190 companies and the wartime practices of more than 325 companies. It includes the use of reports, letters to employees, employee magazines and other publications, study courses, meetings, contests, radio broadcasts—all phases of public relations. The material is well organized, and is graphically presented.

Roots Connersville Blower Corporation, Connersville, Ind.—A 16-page bulletin covering rotary positive gas exhausters and boosters has just been released by this company. It is printed in two colors and profusely illustrated with photographs, curves, diagrams, cross-sections, etc. The foreword traces the inception of the two-impeller displacement principle and shows the various adaptations to which machines of this type have been put through the intervening years. Various sections are devoted to the operation principle, features of design and construction and efficiency curves. Special emphasis is laid on correctly designed gears, and space is given to illustrations of typical installations and applications. Request Bulletin 32-33-B-12.

Wheelco Instruments Company, Harrison & Peoria Sts., Chicago 7, Ill.—This company announces a new edition of its Wheelco thermocouple data book and catalogue. Containing 36 pages, the catalog gives a description of products, prices and recommendations for thermocouple users, and suggests substitutes for restricted materials. It carries the latest amendment to the WPB's Conservation Order L-134, and gives data on selection of thermocouples, lead wire, protecting tubes, heads and insulators. Also carried are temperature conversion tables, millivolt tables, and tables on pipe and wire sizes, decimal equivalents and wire resistances. Instructions are given on checking thermocouples and pyrometers and on construction of thermocouples. Request Bulletin S2-4.

Whiting Corporation, Harvey, Ill.—A new 11-page Bulletin, No. FY-129, "Practical Pointers in Dust Supression," has just been released. It deals with the collection and suppression of dust in industrial plants, and features the uses and applications of Hydro-Clone dust suppressors. Charts and tables are used throughout for illustration, and they furnish much valuable information. Copies gratis.

Books

The Paper Sales Year Book (1944 Edition)—With a page size of 8½ in. x 11 in., totaling 458 pages and bound in a very durable and attractive cover, this volume is an encyclopedia of information on over 700 classifications of paper and paper products. The information covers construction details, standard sizes, available weights, principal uses, war applications, representative manufacturers and other miscellaneous data.

The book also contains a resume of the WPB limitation and conservation orders concerning papers and paper products, a glossary of paper trade terms, an illustrated section on papermaking, and over 100 useful charts and tables.

The book is made up in six major sections: namely, alphabetical index to products, paper and paper products data, paper markets, useful data for paper salesman, manufacturers' addresses, and index to advertisers. The editors in their acknowledgment mention that over five hundred individuals—mill men, converters, merchants, association officials, and others—have had some part in the book's compilation and production.

Published by Davidson Publishing Company, 612 North Michigan Avenue, Chicago 11, Illinois, the book is priced at $7.50 a copy.

Plywoods—Their Development, Manufacture and Application—Written by Andrew Dick Wood and Thomas Gray Linn (with preface by Lawrence Ottinger of United States Plywood Corporation), this book with a British background is divided conveniently into eight major parts. Part I covers the development of the industry; II, the physical properties of wood and plywood; III, the manufacture of multi-ply; IV, laminboards, blockboards, composite boards and specialties; V, grading, testing; packing and storing; VI, plywood-producing countries of the world; VII, the development of wall panelling; and VIII, application. The book is well-illustrated, totals nearly 400 pages, is bound in red stiff-cover, and is priced at $4.00 a copy. The Chemical Publishing Co., Inc., 26 Court Street, Brooklyn, N. Y., is the publisher.

CURRENT MARKET QUOTATIONS

RAGS (Domestic)

NEW RAGS

OPA ceiling prices in sales to consuming mills delivered buyer's usual receiving point, with brokers' allowance not in excess of 5 per cent.

	per cwt.
Blue Overalls	-5.50
Corduroy, Men's	-3.50
Corduroy, Ladies'	-3.00
Washables, No. 1	-3.00
Percales	-4.75
New Soft Blacks	-3.75
Light Prints, No. 1	-4.50
Khaki Cuttings—	
Bleachable	-4.25
Unbleachable	-3.50
New White Canvas	-6.50
New Mixed Blacks	-3.25
Canton Flannels, Bleached	-7.00
Shirt Cuttings—	
New White No. 1	-7.25
No. 1 White Headings	-7.25
White Shrunk	-5.00
Silesias No. 1	-5.75
New Unbleached	-7.50
Fancy	-3.50
Linen Cuttings—	
American	-5.00
White	-14.00
Grey	-14.00

RAGS (Domestic)

f. o. b. New York City

OLD RAGS

OPA ceiling prices in sales to consuming mills f. o. b. cars at points of shipment, with brokers' allowances of $1 to $2 a ton depending on the value of the grade involved.

Roofing—	per ton
No. 1	31.00
No. 2	29.00
No. 3 and No. 4	27.00
Twos and Blues—	
Repacked	44.00
Thirds and Blues—	
Repacked	44.00
Miscellaneous	36.00
Whites, No. 1—	
Repacked	76.00
Miscellaneous	64.00
Whites, No. 2—	
Repacked	58.00
Miscellaneous	53.00

RAGS (Foreign)

ex dock New York City

NEW RAGS

	per cwt.
New Dark Cuttings	Nominal
New Mixed Cuttings	
New Light Silesias	
Light Flannelettes	
Unbleached Cuttings	
New White Cuttings	
New Light Oxfords	
New Light Prints	

RAGS (Foreign)

ex dock New York City

OLD RAGS

	per cwt.
No. 1 White Linens	Nominal
No. 2 White Linens	
No. 3 White Linens	
No. 4 White Linens	
No. 1 White Cottons	
No. 2 White Cottons	
No. 3 White Cottons	
No. 4 White Cottons	
Extra Light Prints	
Ord. Light Prints	
Med. Light Prints	
Dutch Blue Cottons	
French Blue Cottons	
French Blue Linens	
Checks and Blues	
Linsey Garments	
Dark Cottons	
Old Shapperies	

ROPE and BAGGING

f. o. b. and ex dock New York City

Gunny No. 1—	per cwt.
Foreign	Nominal
Domestic	3.25 to 3.50
Wool Tares—	per cwt.
Light	3.25 to 3.50
Heavy	3.50 to 3.75
No. 1 Scrap Bagging	3.00 to 3.25
Manila Rope—	
No. 1 large	-*115.00
No. 1 small	-*105.00
Sisal Rope—	
No. 1 large	-*95.00
No. 1 small	-*80.00
New Burlap Cuttings	5.25 to 5.50
Jute Threads—	
Foreign (Nom.)	6.25 to 6.75
Domestic	5.50 to 6.00
Strings—	
No. 1 sisal	-*80.00
No. 2 sisal	-*60.00
Soft jute	5.00 to 5.50
Mixed	1.50 to 1.75

*OPA ceiling price per ton f. o. b. shipping point.

WASTE PAPER

OPA ceiling prices f. o. b. points of shipment, with brokers' allowance of 4 to 9 per cent.

Shavings—	per ton
White Env. Cuts, One-Cut	67.50-
Hard White Env. Cuts	62.50-
Hard White, No. 1	57.50-
Soft White, No. 1	50.00-
Soft White, One-Cut	57.50-
Soft White, Misc.	43.00-
Fly Leaf, No. 1	33.50-
Fly Leaf, Woody, No. 1	25.00-
No. 2 Mixed Col. Woody	18.00-
Flat Stock—	
Repacked No. 1 Heavy Books and Magazines	33.50-
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New Env. Cuttings	53.00-
New Env. Cuts, One-Cut	57.50-
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Manila Tab Cards, Free of Ground Wood	45.00-
Ground Wood Manila Tab Cards	27.00-
Kraft—	
Envelope Cuttings	65.00-
Mixed Env. or Bag Cuts	55.00-
Tripled Sorted No. 1 Brown	50.00-
New 100% Cor. Cuts	45.00-
No. 1 Old Assorted	35.00-
News—	
White Blank	33.00-
Oversize	17.00-
No. 1 Baled	15.00-
Old Corrugated Containers	23.00
New Corrugated Cuts	18.00-
Mill Wrappers	17.00-
Box Board Chips	14.50-
No. 1 Mixed Paper	14.00-

CHEMICALS

f. o. b. shipping point

Alum (Papermakers)—	
Lump, cwt.	4.25-
Ground, cwt.	4.00-
Powdered, cwt.	4.40-
Blanc Fixe—	
Pulp, bulk, ton	40.00 to 46.50
Dry, barrels, pound	60.00 to -
Bleaching Powder—	
Drums, cwt.	2.25 to 3.10
Casein (Domestic Standard)—	
20-30 mesh (bags), lb.	24.00 to 24.75
80-100 mesh (bags), lb.	—
Argentine, lb.	20.00—
China Clay—	
Domestic Filler Bulk (mine) ton	7.50 to 15.00
Domestic Coating Bulk (mine) ton	11.00 to 22.00
Imported (ship side) Bulk (lump) ton	15.00 to 26.00
Chlorine—	
Tank cars (wks) cwt.	2.00 to 2.25
Gelatine (silicin), lb.	.90 to .95
Glyc. (C.P.) drums, lb.	18.25 to 18.50
Litharge, powd., bbl., lb.	.09 to -
Rosin (Gum)—	
New York, per 100 lbs.	
E	5.20-
F	5.36-
G	5.35-
WW	7.20-
Rosin (Wood), carlots	4.18-
Salt Cake—	
Dom. bulk (wks) ton	15.00 to 16.00
Imp. bulks on dock— (Atl. ports) ton (Nom.)	20.00 to
Soda Ash—	
Bulk (works), cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.35
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—	
Solid, drums, cwt.	2.30 -
Ground and flake, drums, cwt.	2.70 -
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.65 to 2.05
40 deg., 35 gal. drums, (works) cwt.	.80 to 1.45
Starch—	
Pearl, 140 lb. bags, cwt.	3.72-
Pearl, barrels, cwt.	3.83-
Paper (Sp.) bags, cwt.	3.83-
barrels, cwt.	3.92-
Sulphur (crude)—	
(mine) bulk, long ton	16.00 to ——
Talc—	
Dom. 100 lb. bags (mine) ton	16.00 to 21.00
Imp. bulk, ton (Nom.)	—
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05¾ to .06
Calcium Pig., bbls., lb.	.05 to .05¼
Zinc Sulphide, bbls., lb.	5.60 to 5.85

WOOD PULP

OPA maximum prices applicable to wood pulp delivered to consumer mills located East of the Continental Divide exclusive of Denver, Colo. (West of the Continental Divide and in Denver, Colo., ceilings are $6 per ton lower):

Bleached softwood sulphite	86.00
Unbleached softwood sulphite	74.00
Bleached hardwood sulphite	83.50
Unbleached hardwood sulphite	71.50
Northern bleached sulphate	86.00
Southern bleached sulphate	79.00
Northern semi-bleached sulphate	82.00
Southern semi-bleached sulphate	75.00
Northern unbleached sulphate	73.00
Southern unbleached sulphate	63.50
Bleached soda	72.00
Unbleached soda	68.00
Ground wood pulp	50.00
Ground wood—paper machine dried and mutilated	53.00
Sulphite screenings	43.50
Sulphate screenings	38.00
Ground wood screenings	32.00
Northern unbleached sulphate siderums	73.00
Southern unbleached sulphate siderums	63.50
Standard news print siderums	50.00

PAPER

f. o. b. New York City

Boards—	per ton
Binders	84.00-
Chip	48.00-
Chip, tube and can	50.00-
Chip, full-bending	52.50-
Chip, sgl. mla. lined	60.00-
Coated, white patent .016	80.00-
.020 and heavier	75.00-
Kraft liner	63.00-
News	48.00-

Book Papers—OPA base maximum prices per cwt. 4 cases or equivalent, f. o b. mill with quantity, weight, manufacturing and other differentials allowed:

Uncoated (Untrimmed)

Book, White (M. F.)—	
A Grade E. F.	8.25
B Grade E. F.	7.80
C Grade E. F.	7.55
D Grade E. F.	7.30
E Grade E. F.	7.05
No. 2 Uncoated Offset 4 sides. White	8.45
Coated White (Trimmed 4 sides)	
No. 1 Glossy	11.90
No. 2 Glossy	10.85
No. 3 Glossy	10.15
No. 4 Glossy	9.80
No. 5 Glossy	9.30
C2S Offset	10.40
C1S Litho (Varnish)	10.05
C1S Litho (Non-Varnish)	9.80

Writing Papers—OPA base maximum prices per cwt. on writing papers, f. o. b. mill with zone, quantity, packing and other differentials allowed:

Rag Content Bond—	per cwt. 20 lb.	16 lb
Extra 100% Rag	34.00	34.00
100% Rag	28.00	28.00
75% Rag	20.00	20.00
50% Rag	16.00	17.25
25% Rag	14.00	15.00

Rag Content Ledger—	per cwt. Zone 1
Extra 100% Rag	35.00
100% Rag	29.00
85% Rag	26.00
75% Rag	21.00
50% Rag	17.00
25% Rag	15.00

Sulphite Bond—	per cwt. 20 lb.	16 lb.
Air dry, watermarked	12.75	13.70
No. 1 (M. F.) watermarked	9.00	9.70
No. 2 (M. F.) watermarked	8.25	8.85
Plain (M. F.) unwatermarked	7.60	8.20

Sulphite Ledger—	per cwt. Zone 1
No. 1 (M. F.) watermarked	10.00
No. 2 (M. F.) watermarked	9.25
Plain (M. F.) unwatermarked	8.60

Glassine (f. o. b. mill)—	per cwt.
Embossed (25 lb. up)	13.75 to 14.25
Bleached (25 lb. up)	12.75 to 13.25
Unbleach. (25 lb. up)	11.50 to 12.00
Greaseproof—	
Bleach. (25 lb. up)	11.00 to 11.50
Unbleach. (25 lb. up)	10.00 to 10.50

News—OPA Ceilings	per ton
Rolls (Contract)	58.00
Rolls (Spot)	(nominal)
Sheets	66.00

Tissues (Carlots)—	per ream
White, No. 1	1.12½ to 1.20
White, No. 2	1.00-
Bleached Anti-Tarnish	1.15-
Colored	—
Anti-Tarnish Kraft	.70-
Manila	.90 to .95
Napkins, semi-crepe (12½ lb. to M shts.) per cs.	.60-
Napkins, full crepe and emb'sed (12½ lb. to M shts.) per cs.	.00-
Toilet, Bleached (M shts.) per cs.	5.65-
Toilet, Unbleached (M shts.) per cs.	4.25-

Towels—	per cases
Bleached	3.20 to 3.75
Unbleached	2.60 to 3.05

Wrappings (Kraft)—	per cwt.
Super-Standard	5.25 to 7.65
No. 1 Wrapping	5.00 to 7.40
Standard Wrapping	4.75 to 7.15
Standard Bag	4.37½-

Wrappings (Sulphite and Bleached Kraft)— (Rolls, f. o. b. mill)

Bleached papers—

M.F. & M.G. Waxing.	per cwt.
20 lb. (Carloads only)	7.25 to 7.50
(10,000 lbs.)	7.50 to 7.75
Drug wrapp. 35 lb.	7.00 to 7.25

Unbleached Papers—

Com. Grd. Butch. 40 lb.	5.50 to 5.75
No. 1 Butchers	5.75 to 6.00
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.25 to 6.50
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.00 to 6.25
Steam Finish, 50 lb.	5.00 to 5.25
Water Finish, 40 lb.	5.50 to 5.75

Manilas—	
Envp. Mla., Sub. 16-40 (No. 1)	6.00 to 6.50
Envp. Mla., Sub. 16-28 (No. 2)	5.75 to 6.00
Envp. Mla. (Prices based on large sheets untrim'd reammarked, in bdls.)	
Wrapp. Mla. 35 lb. up—	
No. 1	6.00 to 6.25
No. 2	5.75 to 6.00
M. G. Sulphite and Kraft (other than Waxing)	
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Grade B-20 lb.	6.75 to 7.00

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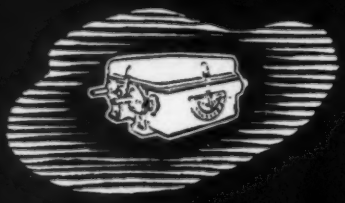

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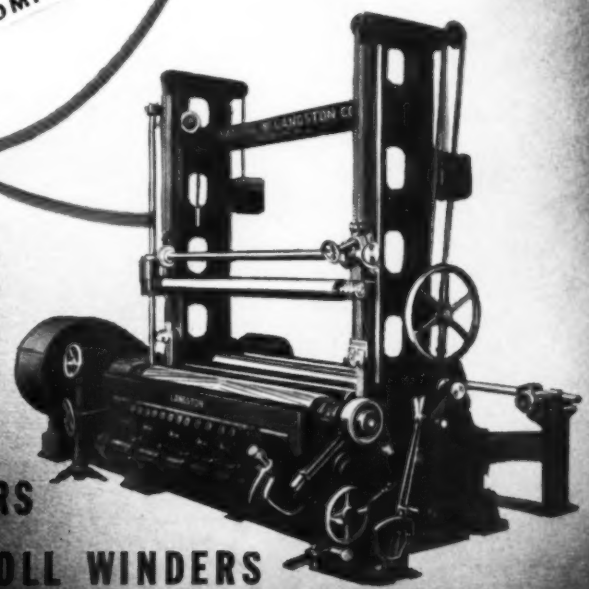

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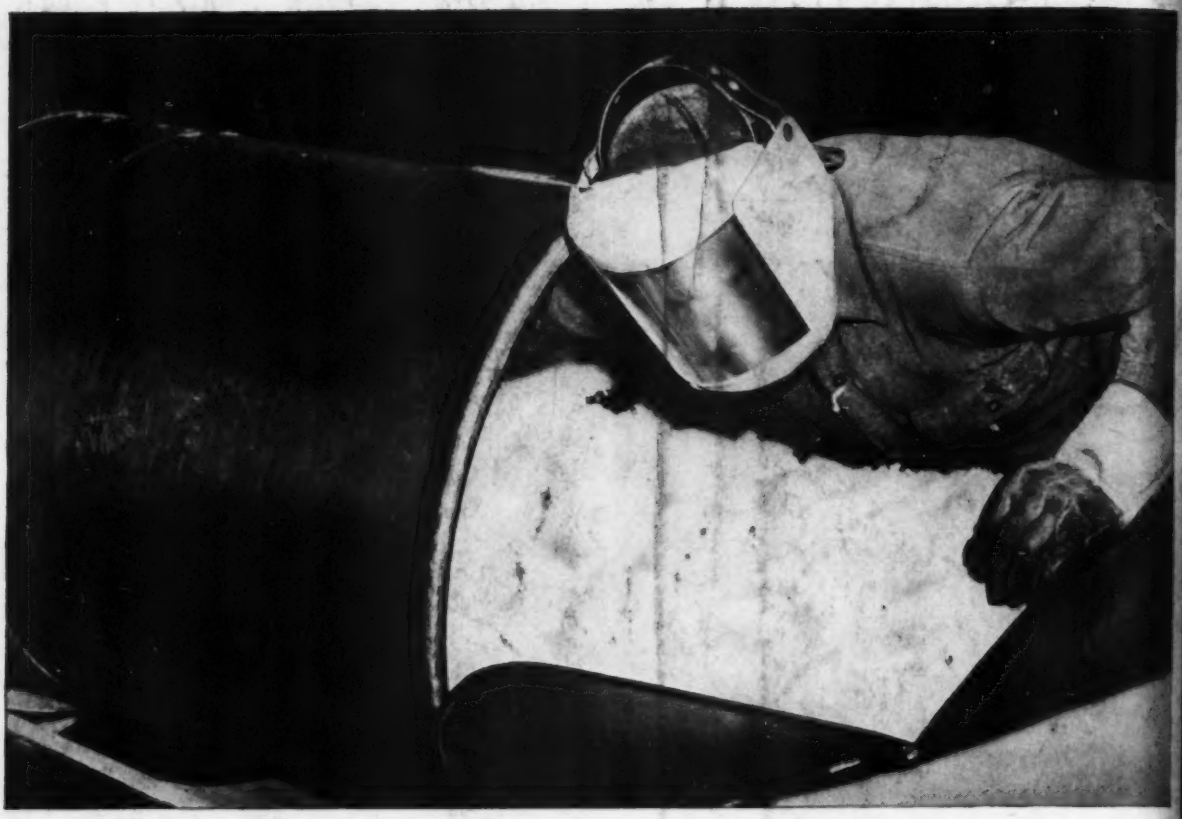

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